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JOHN NACHBAR, M.A., M.D.
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PART II

EPIDEMIOLOGICAL SECTION	LARYNGOLOGICAL SECTION
MEDICAL SECTION	NEUROLOGICAL SECTION
OBSTETRICAL AND GYNÆCOLOGICAL SECTION	



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1912

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COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1911-12

EPIDEMIOLOGICAL SECTION



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The Council think it right to state that the Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Epidemiological Section.

October 27, 1911.

Sir SHIRLEY MURPHY, Vice-President of the Section, in the Chair.

Plague in Manchuria.

By REGINALD FARRAR, M.D.

DURING the winter of 1910-11 Manchuria was ravaged by an outbreak of pneumonic plague, which recalls some of the historic outbreaks of the Middle Ages, but to which modern times afford no parallel.

When compared with the mortality caused by bubonic plague in India, the actual proportions of the Manchurian epidemic do not seem large, but it captured the popular imagination by reason of the dramatic features which attended it, its mysterious origin, rapid spread, and appalling virulence.

I will pass lightly over the features which intensified the dramatic interest of the outbreak, before considering those facts which have a more serious interest for ourselves as epidemiologists.

The Manchurian plague outbreak has in a high degree the fascination that belongs to all that is Oriental and mysterious. The disease is believed to have been transmitted to man by the tarabagan, a large marmot inhabiting the remote wilds of Siberia and Mongolia. The first human victims claimed were probably trappers who hunt and trap this animal for the sake of its fur. After an explosive outbreak in Manchu-li, the frontier town of Siberia and Manchuria, and in Harbin, it was rapidly carried south along the railway and the roads by the hordes of Chinese coolies from Shantung, who migrate every year into Manchuria for the soya-bean harvest, and return home to worship their ancestors at the Chinese New Year. The plague travelled through Manchuria,

the Tartar province whence issued the present Manchu dynasty, the conquerors of China, by a route every mile of which has been fought over by the Russians and Japanese, to whom Manchuria is as Naboth's vineyard, along railway lines which are partly Russian, partly Japanese, and partly Chinese. In consequence, the difficulties of sanitary administration were enormously enhanced by international diplomatic complications. The virulence of the infection was such that in many instances whole families and large households were mown down by the disease, and its fatality so appalling that out of more than 40,000 cases only three recoveries are claimed. Those who took the disease passed rapidly into a stuporous condition and died generally within forty-eight hours. Men walking along the streets would be observed to stagger, reel, and fall. Where they fell, there they lay crouching, for none dared succour them. They passed from stupor into coma, and died shunned and untended. The poor corpse lay frozen stiff in the attitude of death by the bitter cold, till the burial coolies came and dragged it away with ropes and hooks. None dared give shelter to a stricken patient, and the sick were often thrust out into the streets to die, lest their death should implicate the household. Those who died were often hidden in the "k'angs" or under the roofs of their houses, or in other places of concealment.

Burial was impossible, for the temperature of Manchuria in winter is often 40° F. below zero, and the ground is frozen hard to a depth of more than 3 ft. Eventually sanction was given—for the first time in Chinese history—to cremation, and in several towns piles of bodies—coffined or uncoffined—that had been lying unburied for weeks were burned on pyres or in huge pits.

The sick were tended in hospital by mysterious figures swathed from head to foot in white robes and hoods, their eyes concealed by goggles and their features by gauze masks, like members of some awful *Vehmgericht* whose doom was certain death. In several instances those that tended the sick fell victims to the plague—the French Dr. Mengy, two French Sisters of Charity in Chi-fu, the Russian Marmontoff, Dr. Jackson, of Moukden—whose funeral oration, spoken by the Viceroy of Manchuria, is a monument of Chinese eloquence—and others.

The dread of plague was over all society. In stricken towns commerce and social intercourse were at a standstill. Those of stricken households were refused admission into shops or into the homes of their friends and kinsfolk, and often depended for sustenance entirely on food left by neighbours outside their doors.

The guards at the city gates, the police in the streets, the railway military guards, all wore masks, and many private citizens would not venture abroad without a mask. A gauze mask was an indispensable part of the uniform of every Japanese soldier in Manchuria for several months, and was conscientiously worn, whereas the Chinese soldiers and police were often content to wear theirs round their necks. When Dr. Petrie and I visited Schuang-cheng-fu we were preceded by a military escort of sixty cavalry with band and banner. All the escort wore masks, and even the commander of the escort carried a gauze mask, worn as a sword-knot. In Chi-fu the attempt to induce contacts and the travelling coolies in inns to wear masks was only successful when these masks were stamped in vermilion with a temple seal, and so could be regarded as amulets.

I have said enough to indicate and to explain the profound impression made by the plague in Manchuria upon the Government and upon society generally. When, however, we come to consider in cold blood the actual extent of this epidemic, we are surprised to note that its real proportions were, in fact, relatively small; we find that it was brought under control with comparative ease, despite the complete absence at the moment of its outbreak of an organized sanitary service in China; and the limitation of the epidemic rather than its extension is found to be the factor that requires explanation.

The number of plague deaths in Manchuria as ascertained by careful official computation was 43,972, and if we allow for the few cases that occurred outside Manchuria, and for deaths concealed or otherwise not ascertained, we shall be justified in assuming that the total mortality was little, if at all, in excess of 45,000.

It is impossible to estimate with any degree of accuracy the fluctuating population of Manchuria, and the official returns cannot be regarded as trustworthy, but it has been computed on good authority to be about twenty millions. In this computation thirteen millions are assigned to the Province of Feng-tien, five millions to Kirin, and two millions to Heilung-chiang. On this basis the attack-rate would be about 2.25 per 1,000 of population, and as practically all cases were fatal, the total mortality would be in the same ratio. It must, however, be remembered that the incidence of the disease was almost entirely confined to towns in the railway zone, or in its neighbourhood.

When we remember that plague has caused a total mortality of

more than seven million deaths in India, during the last fifteen years, that for three years (1904, 1905, and 1907) the total annual mortality has exceeded the million, that in some years deaths have occurred at the rate of 20,000 or 30,000 a week for months in succession, and that even during the current year more than 600,000 deaths have occurred during the first eight months, it is obvious that it is not in respect of its mere bulk that the Manchurian plague outbreak has any special importance. On the other hand, special interest does attach to the behaviour of the outbreak, and we have to ask ourselves—What was its origin, what its nature, and what were the circumstances that explain, on the one hand, its explosive outbursts, on the other, its rapid decline and complete cessation?

It is now matter of common knowledge that the tarabagan (*Arctomys bobac*), a hibernating marmot of the size of a large cat, found in Mongolia, in North-west Manchuria and in Transbaikalian Siberia, is susceptible to plague infection, and that plague epizootics occur not infrequently amongst these animals. They are said to hibernate during the winter months, say from September to March; when they emerge in the spring the younger animals seek new homes in which to breed. The new burrows, it is said, often run into old "earths," which may contain dead animals left from a previous season, by which the younger generation may be infected. The tarabagan is hunted and trapped by Buriats, Mongols and Cossacks for the sake of its fur, its flesh, which is esteemed a delicacy, and its fat, which is used for lubricating leather. This circumstance supplies probably the initial factor in the Manchurian outbreak—an animal liable to epizootic plague, and men by whom that animal is hunted. It does not, however, suffice to explain its rapid diffusion.

Dr. Clemow has collected records of small outbreaks, each comprising less than a dozen cases, which have occurred in recent times among Cossacks and Mongolians; and it is probable that there have been in the past many such localized occurrences. But these visitations affecting semi-nomadic families in sparsely populated regions have not, at any rate within the last two and a half centuries, led to any wide diffusion of the disease, and it is recorded that when they do occur the members of affected families are rigorously isolated from contact with their neighbours. Moreover, the regular trappers have learnt, probably from the experience of many generations, to recognize the signs of plague in the tarabagan. The plague-stricken animal is languid and ceases

to utter its peculiar barking cry, which the Chinese say resembles the words "Pu pa," meaning "there is no fear," and is regarded by them as an assurance that the beast may safely be caught. Its gait becomes unsteady. As a confirmatory test the hunters are wont to make an incision into the paw of the animal. If the blood is coagulated and does not flow readily the animal is regarded as diseased and given to the dogs, which are said not to suffer from eating it. Not only do the experienced hunters reject plague-stricken animals, but it is said that they quit the districts in which they are found.

If, then, the Manchurian plague may be attributed in its inception to the tarabagan, additional factors to those already given are required to account for its diffusion.

The first of these is the fact of an enormous increase in the demand of Europe and America for marmot-skins, which are not only sold as such, but are also dyed and sold as imitation sables. This increased demand has attracted inexperienced hunters—mostly Shantung coolies—to the industry, and whereas the experienced trappers hunt or trap their quarry in the open, and so catch as a rule only healthy animals, these new hands have nearly always dug the animals out of their holes, into which, if diseased, they creep to die, or have run down in the open stricken specimens too languid to escape.

Another factor, the most important of all, is the enormous annual migration from the Shantung province into Manchuria. The Province of Shantung is in the drainage area of the Yellow River which, owing to the frequent disastrous floods to which it is liable, is known as "China's Sorrow." The hardy and adventurous Shantung coolie is therefore driven to seek employment at a distance from his native home. Thousands of these coolies annually migrate to the rich Manchurian provinces, which are crying out for additional labour for the soya-bean harvest and other industries. Thousands also found lucrative and congenial employment in the Transvaal mines till they were recently excluded from South Africa by the action of the British Government. This exclusion had the effect of adding enormously to the usual invasion of Manchuria from Shantung.

Now it is a cardinal requirement of the Chinaman's religion that he shall, if it is in any way practicable, return home to worship his ancestors, collect and pay his debts, and perform other social obligations at the Chinese New Year which falls early in January. Hence it happened that thousands of Shantung coolies were travelling during the latter part of December and the beginning of January by road and rail

along the route that runs in a south-easterly direction from Manchu-li to the Liao-tung peninsula. This exodus corresponds with the track of the plague, as will be evident on reference to the accompanying map.

The disease first appeared, so far as our positive knowledge carries us, in Manchu-li (Lupin-fu), on October 25, being probably first introduced—though we have not definite evidence as to this point—by tarabagan trappers. Five hundred and twenty-two deaths occurred in Manchu-li. On November 8 plague appeared in the great railway junction town Harbin, being introduced by two tarabagan trappers from Manchu-li. Intermediate towns on this line—Hulun (twenty cases), and Lung-kiang-fu (1,402 cases), were attacked on November 9 and 13 respectively. Harbin, or rather Fu-chia-tien, the native town which adjoins it, bore the chief brunt of the plague, 5,272 deaths occurring in Harbin and Fu-chia-tien, and 1,449 on the Harbin railway line. From Harbin the plague radiated in different directions by road, breaking out at Pinchow (1,184 cases) on December 18, Hulan-fu (6,067 cases) on December 17, Suihua-fu (1,583 cases) on January 1, Hailun-fu (2,057 cases) on the same date, Pa-yem (1,123 cases) on January 23, Acheng (1,794 cases) on December 23, besides minor outbreaks. Proceeding down the railway-line, Shuang-cheng-fu (4,551 cases) was attacked on January 2, Chang-chun (3,104 cases) on January 3, Kirin-fu (623 cases) on January 18, Moukden (2,571 cases) on January 2.

The almost simultaneous outbreaks occurring at Shuang-cheng-fu, Chang-chun, and Moukden, point strongly to conveyance of the disease by rail, and correspond with the rush homeward of the Shantung coolies for the Chinese New Year. We have also positive evidence that numerous cases were found on the trains, and particularly in the crowded coolie carriages. The map (fig. 1) shows that radiation by road to surrounding villages occurred from the railway junctions of Chang-chun and Moukden.

The plague made some progress along the Chinese railway from Moukden onwards, but was practically arrested by the Great Wall at Shanhaikwan, very few cases, I believe only about a score, occurring at Peking. About ninety cases are known to have occurred in Tientsin. This arrest is due partly to the strict railway quarantine established, when once the danger was recognized at Chang-chun, Moukden, and Shanhaikwan, and partly to the fact that the route of the returning Shantung coolies does not lie through Peking, but down the Liao-tung peninsula and across the Gulf of Pechili to Chi-fu. Accordingly we find

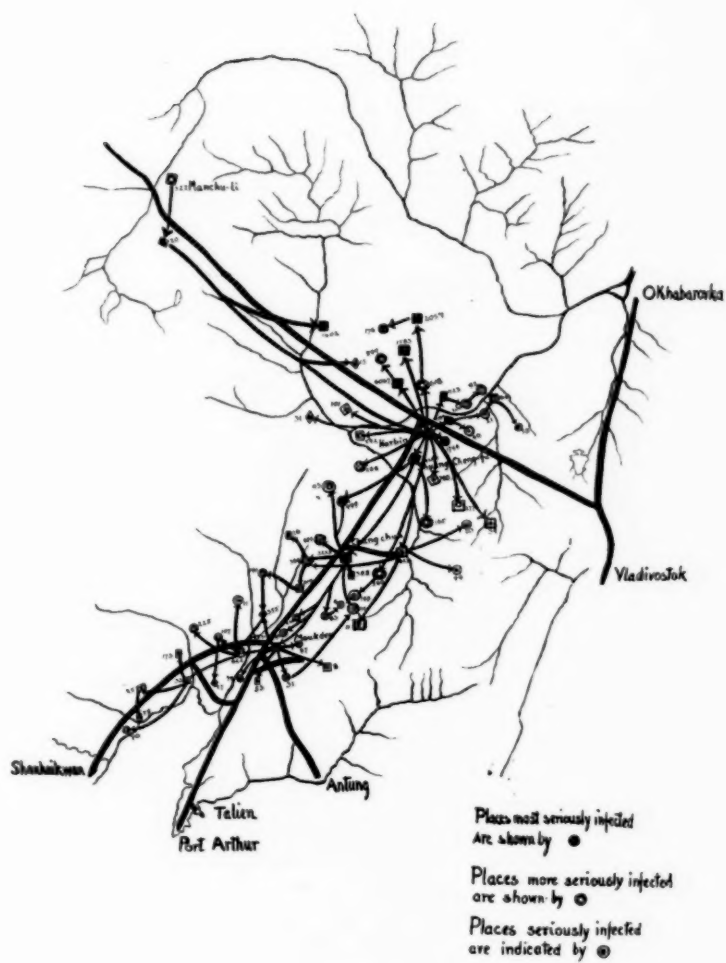


FIG. 1.

that cases occurred at Dairen (Dalny) and at Chi-fu and in its neighbourhood. I have no figures for those outbreaks.

The Japanese claim to themselves—and deserve—great credit for the rigorous quarantine measures by which they suppressed the plague in Dairen. These measures were perhaps applied with undue harshness to all Chinamen, no discrimination being made between respectable Chinese gentry and merchants and the wandering coolie class, but they were certainly effective. At one time they even talked of stretching a live wire across the whole peninsula. It must be remembered, however, that the Japanese, being at the end of the line, had ample warning and time for preparation, whereas Harbin was taken by surprise.

When—somewhat too late—a proper quarantine system was established in Fu-chia-tien (the native Harbin) it was well concerted, thoroughly applied, and very effective.

From the Liao-tung peninsula the Shantung men would make their way to Chi-fu, and perhaps other points along the coast, many of them in junks, the traffic of which cannot readily be inspected or controlled in a sanitary sense. Many cases occurred in Chi-fu, and some, I believe, in neighbouring villages. I have not the figures for Chi-fu, and there was no properly organized sanitary service here, though the doctors were allowed to search for cases in inns and poor-houses on their own initiative, but it is noteworthy that, so far as could be ascertained, not a single case occurred among the respectable Chinese residents or among the servants of the Europeans. Practically all the cases that occurred were among the coolie class, and the majority among coolies travelling to their homes in Shantung.

To illustrate the virulent infectivity of the disease I may relate the following incident. I had on one occasion visited, with Dr. Bennett, the plague hospital, in which at the time there were only two patients. We then visited an old cigarette factory, which was being used as a lodging-house for coolies passing through the town, and found there six men sitting together on a k'ang some 4 ft. square. They made no complaint and did not look particularly ill, but hearing one of them cough, I suggested that we should make him spit into a piece of paper. He was spitting blood. We made the others spit also. They were all spitting blood. The whole six were dead by the evening of the following day.

The extent to which villages in Shantung were infected by those who reached their homes is not known. The records which are avail-

able concern Manchuria only, but we heard no more of plague after the end of March.

A glance at the diagram here exhibited (fig. 2) shows that, from its first recorded appearance on October 25, till nearly the end of December, the plague made very little progress, though probably not all the cases that occurred were recorded at first. From about December 25 to the end of January the total rose in a steep curve, corresponding to the rush homeward of coolies returning to Shantung for the New Year, the climax being January 29, on which day more than 1,000 cases occurred. It will be seen that on about seven occasions the daily total approached or exceeded 1,000. A decline set in about the middle of February, a sudden drop occurred at the beginning of March, and at the end of the month the epidemic had almost entirely ceased.

The bacillus isolated and cultured by numerous bacteriologists in the course of this epidemic is specifically identical with the *Bacillus pestis*, isolated from previous epidemics of plague, which have been mainly or exclusively of the bubonic type. The strain isolated in Harbin was of a highly virulent type, rapidly producing septicæmic plague when injected into animals, but not more virulent *per se* than certain strains which have previously been isolated in bubonic outbreaks. There is no evidence whatever that the decline or cessation of the outbreak was due to any loss of virulence of the bacillus.

The epidemic was almost without exception one of primary pneumonic plague. Not a single bubonic case was reported to the Conference, nor, though I travelled over the whole affected area and visited most of the principal centres of the disease, did I hear of any such. One or two cases of so-called intestinal plague, in which the faeces contained large numbers of a bipolar staining bacillus, were adduced, but we did not consider at the Conference that these were established by trustworthy evidence. Dr. Strong, who made twenty-five autopsies on plague cases in Moukden, considers that the fact that the oesophagus was found to be normal in every case examined is an argument against the occurrence of primary intestinal plague infection, since in many of these pneumonic cases plague bacilli must have been repeatedly swallowed in the bronchial secretions and saliva.

Practically 100 per cent. of all cases were fatal. Three recoveries under the use of repeated injections of serum were claimed by the Japanese in Dairen. I saw two of these patients who had been in

hospital, I think, thirty and forty-three days respectively. Both of them were emaciated and had severe bedsores and a feeble, very compressible pulse; one of the cases was certainly and admittedly complicated by advanced pulmonary tuberculosis. I cannot say whether these patients are still alive. The diagnosis had not, it seems, been very rigorously tested.

One case of phenomenal insusceptibility was introduced to the Conference, an aged Dr. Gu, who had treated more than 200 cases in a crowded building used as a native plague hospital in Fu-chia-tien, on the mediæval lines of native Chinese medicine—needling, slapping, pinching, &c. This heroic old gentleman, though he lost all his patients, bore the whole brunt of the epidemic and escaped unscathed, having throughout refused to wear a mask or take any personal precautions. There were some grounds for supposing that he may have come through an abortive attack.

Dr. Christie also brought before the Conference the case of a Mrs. Lin, who nursed five cases in succession, but herself escaped. There were circumstantial grounds for believing that she may have acted as a carrier, but this theory cannot be regarded as well established.

So far as could be ascertained, the chief, perhaps the sole, method of infection during the epidemic was the inhalation of plague bacilli expelled in droplets during the act of coughing, the risk to the person exposed bearing a direct relation to his proximity to the patient and the duration of exposure. Dr. Strong, who in collaboration with Dr. Teague exposed plates and guinea-pigs at varying distances from the mouths of plague patients, showed that during normal or even dyspnoëic respiration plague bacilli are not usually expelled, but that in the act of coughing they may be widely disseminated into the air surrounding the patient.

The incubation period of the disease varies from two to five days. A rise in temperature and an increased pulse-rate are the earliest symptoms observable, but the characteristic clinical symptom of the disease is the expulsion of thin blood-stained sputum, and an accurate diagnosis can of course only be made by bacteriological examination of this. The patient passes into a stuporous condition, and dies as a rule within forty-eight hours from the appearance of blood-stained sputum. Mucous râles may be heard in the thorax, but auscultatory diagnosis is of very little value, as the patient is usually dead before any gross lesions have time to develop in the lungs. The pulse becomes very feeble and compressible, and the patient dies of cardiac failure from the rapid development

CHART SHOWING THE PLAGUE DEATH RATES OCCURRING IN MANCHURIA DURING THE LAST SIX MONTHS.

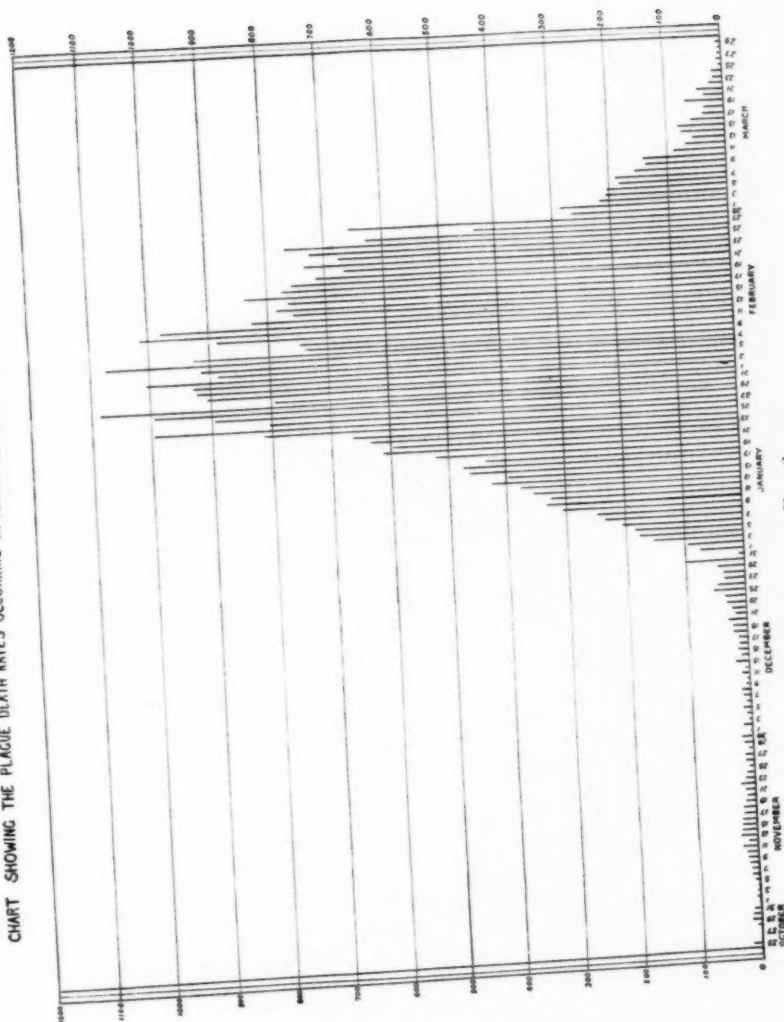


FIG. 2.

of toxæmia over the large area presented by the bronchial mucous membrane. There is a true bacteriæmia in practically all cases, and the toxin engendered is probably an endotoxin.

There is no evidence that fleas bore any part whatever in the spread of this epidemic, and despite of the crowded state of the native inns during the return of the coolies to Shantung, dark and ill-ventilated chambers in which men lie huddled on the k'angs like herrings in a barrel, and despite the fact that during the rigours of the Manchurian winter the coolie neither washes nor even removes his heavy clothing, fleas are apparently uncommon in the winter season in this region. I personally never observed a flea on any of the patients.

Neither—and this is a very remarkable fact—was a single case of rat infestation established. Many thousands of rats were examined during and after the epidemic by Russian, Japanese, and Chinese experts, but not one case of rat-plague was proved. One instance only was brought to the notice of the Conference, but this solitary case was not regarded by us as satisfactorily confirmed. On the other hand, fairly good circumstantial evidence was adduced of the occasional infection of donkeys, horses, and mules—animals which are often employed to turn oil-mills within enclosed buildings. The absence of rat infestation is perhaps the more remarkable, inasmuch as it has been repeatedly proved that living plague bacilli can be recovered from the mucous membrane of the mouth of plague corpses, buried or unburied, which have been more than three months dead, even from putrid corpses, though most corpses, especially if buried, would mostly be frozen in Manchuria. Professor Zabolotny told me in July that they were still finding corpses in Harbin from which the plague bacillus could be readily recovered. It might be thought that rats could become infected by devouring such corpses.

We can now discuss the causes which brought about the cessation of the epidemic.

I have already said that there is no evidence whatever that its decline was due to any loss of virulence in the bacillus. Neither does the decline appear to have been influenced by climatic conditions. It is true that the epidemic began to decline about the middle of February and subsided more rapidly during March, but a diminution in the number of cases was observable before there was any substantial abatement of the severe cold of Manchuria; and the cases that occurred in March were to the full as severe and fatal, and apparently quite as

infectious, as those that occurred in January, when the plague was at its height.

The main factor in the decline of the epidemic was probably the preventive measures enforced. These were either administrative measures, railway inspection and quarantine, isolation of patients and suspects, segregation and inspection of contacts, house-to-house visitation, cremation, the enforcement of personal precautions, &c. ; or, in the numerous towns where such administrative measures were either not employed at all or were very inadequately carried out, a very efficient substitute was found—when once public opinion was awake to the terrors of the disease—in the crude efforts of the people to protect themselves. Commerce and social intercourse in infected towns came almost to a standstill. All intercourse was refused with members of infected houses, who were sometimes even forbidden to leave their homes, and were dependent for food on supplies deposited by friendly neighbours outside the house. I was told in Chi-fu that in one instance the local Tao-tai had drawn a cordon round an infected Shantung village, and would allow no one to leave it. A similar story is recorded of the village of Eyam in Derbyshire, in 1666. Isolation on these lines, enforced by public opinion, doubtless explains, to some extent, the limitation of plague outbreaks in mediæval times.

A pathetic episode was related to me in Schuang-cheng-fu. A young Manchu girl, an heiress, was the sole survivor of a household of seven persons. She went to the house of her betrothed and begged admission, but was repulsed by his mother. She then returned to her own home, set fire to the house, and perished in the flames.

Another factor in the decline of the outbreak was probably the diminution of traffic by rail and road that ensued when the homeward-bound Shantung coolies had reached their destination.

The question whether such an epidemic is likely to recur is of importance. I think we may infer that a plague epidemic of purely pneumonic type with absence of rat infestation is, despite the virulence of its infectivity, relatively amenable to control by administrative methods. In India it is comparatively useless to isolate the patient and his contacts. The practical problem—almost insoluble—is control of the rat epizootic, and wholesale evacuation appears to be the sole method of real value. In Manchuria the disease may again make its appearance under similar conditions, but the railway and civil authorities ought not again to be taken by surprise as they were on this occasion. We may be sure that a sound system of railway inspection and

quarantine will be in force if plague shows itself again another year, and I know that an excellent sanitary service has been devised for Harbin and Moukden, and other places along the route, by my friend and colleague, Dr. Wu Lien Teh. No subsequent outbreak is likely to attain the dimensions of that with which we have been dealing to-night.

There are several aspects of this question which I have been unable, for lack of time, to consider, but I must not trespass further on your indulgence. I shall endeavour to deal with other points if they are raised in the course of the discussion.

DISCUSSION.

The CHAIRMAN (Sir Shirley Murphy) said he felt sure all present would wish to join in a cordial vote of thanks to Dr. Farrar for his most interesting paper. The Section did not often have a story from an infected area in which the details were described in so graphic a manner. The author had had the advantage of seeing plague in India, and he was thus able to compare the Indian plague with the Chinese plague. In India the disease was largely bubonic and exceptionally pneumonic; in China it was apparently wholly pneumonic. The absence of rat infestation which the author noticed in China was another point to bear in mind. The feature which had interested him particularly was the fact that this Manchurian epidemic was brought to an end quickly. As far as he knew it was a general rule that when an epidemic malady was dying out the fatality-rate was gradually reduced. Towards the end of an epidemic one found that out of a given number of people attacked the majority recovered. But matters seemed to have been different in China, for, unless he misunderstood the author, all the way through nearly everybody who was attacked died of the disease. Bearing that in mind, he was puzzled to know what it was which brought the epidemic to an end. Dr. Farrar was of opinion that this was due to administrative efforts. It was astonishing that among an Asiatic race like the Chinese there should be such efficient administration as to enable complete control of the movements of people necessary for stamping out the disease to be exercised, for he supposed it was largely a question of control of movements of infected persons. There was one item of considerable comfort, namely, that a large factor in dealing with the plague and its arrest was the wearing of the mask, which seemed to have been a preventive of infection in a large degree.

Dr. SANDWICH said he was glad to see the reference by the author to that wonderful funeral oration delivered by the Viceroy of Manchuria on the death of Dr. Jackson, of Moukden. He did not think anything in the history, even

of the Epidemiological Society, was more wonderful than the fact that the Viceroy should be calling on the spirit not of the "foreign devil," but of Dr. Jackson, who had helped them so much in life, asking him to assist them now. It was really a wonderful peroration. He would very much like to ask whether Dr. Farrar could throw light on one or two points of doubt. The first was, as to how plague was communicated from the marmot to man. In the case of pneumonic plague it was known that the plague bacillus was coughed up and transferred by means of the air directly from man to man. This was easy to understand. It had been said now and on former occasions that the marmot spread disease; this might be accepted as an epidemiological fact, but one would like to know how the indiscreet hunters, who dug the marmot out, succeeded in catching pneumonic plague, because it appeared from the paper that there was no bubonic plague at the origin of the outbreak. The author said that the disease was pneumonic from the beginning, at least as far as information could be obtained, going back to October. One must suppose that the first individual or individuals caught the plague, of the pneumonic form (or the septicæmic form), from the marmot. He did not throw the smallest doubt on the fact that they did so, but he would like to know, if possible, how the plague bacillus got from the marmot to the lungs of the man. Bearing in mind the fact already referred to, that rats and rat-fleas had nothing to do with the present story, he would like to ask, as a matter of curiosity, if the marmots had fleas, and, if so, whether they had been studied. Also, as so much had been said about the over-crowding of the people, and there was no doubt that that was how they gave pneumonic plague to each other, if there was a human flea season. When the weather was not so cold was there a time recognized as the breeding time for human fleas? All those who had interested themselves in fleas would know there was a season for them—the human variety as well as others. His next question was, had the plague bacillus ever been found in or on a marmot? This was a very vital point. In the summer he privately asked Dr. Petrie this question, and he answered that he thought there had been no absolute proof of it up to date. He (Dr. Sandwith) was not suggesting that the marmot was not responsible, but if it was the idea that this animal should be killed off by thousands, it would be convenient if it were first ascertained whether it did or did not harbour the plague bacillus. He understood that other experiments were to be carried out, and perhaps Dr. Farrar would be able to enlighten the meeting on that point. He would like to hear more about the masks to which reference had been made. He wanted to know, in case somebody with pneumonic plague came his way—which had happened before now—who were the people who should wear the masks? Patients should be compelled to wear them; he believed that the most recent practice at some consumption hospitals was for patients to wear them while being examined. And he thought it right that doctors and nurses should wear them. But was it necessary for the people who were parading the streets, policemen, &c., to

wear them also? He did not suppose Dr. Farrar would wish everybody to wear masks, but as he had come straight from the line of battle he could perhaps tell the meeting how to avoid the bullets better than anyone else. And what kind of masks should they be? He had been interested in hearing a distinguished Local Government Board official mentioning quarantine with some faint amount of praise. He had suffered so much from Dr. Farrar's official ancestors, who had always regarded quarantine as anathema, that it was agreeable to find a man who had come back from an epidemic with some faith in the measure. Land quarantine could not be praised as a general measure, because it was usually carried out far too late. There were certain occasions when it might be useful if it included isolation and thorough inspection. Dr. Farrar had had to deal, together with his Chinese colleague, whose methods were different, with a mortality of 100 per cent. It did not matter much about the methods when the mortality was the same. But the point was that all the people affected died, and therefore they could not carry the infection. Now it happened occasionally that a case of pneumonic plague recovered, though it had only happened once in his experience to meet with such a case. He had sometimes quoted that as an instance of how absurd quarantine would be, because he had seen a person living in a hospital for three weeks with less cough than was manifested by some in the room that evening, and yet spitting up a little sputum which was harmless in appearance but so virulent in character that it killed a guinea-pig every day for three weeks. There was no appearance of blood; it was pneumonic plague in convalescence. That, he had always thought, would be the sort of person to evade successfully all quarantine rules or inspection, because, as Dr. Farrar said, one could not tell by auscultation or percussion that the individual was ill. The last remark of Dr. Farrar was extremely interesting and useful, namely, the comparison of the control of pneumonic plague with that of bubonic plague. In the former one had the great advantage, so far as the spread of the disease was concerned, that the person afflicted with pneumonic plague died and the infection died with him, whereas the rat and the nimble flea, when infected, escaped and carried the plague to fresh human beings or to fresh rats.

Dr. C. J. MARTIN, F.R.S., said he was sure those present would agree that they had listened to an excellent little account of the happenings in Manchuria last winter. He had had the opportunity of reading through the whole of the minutes of the Conference in Moukden, and he could confidently say that this paper contained all essential matter and was, moreover, much better reading than those minutes. Indeed, as far as picturesqueness and literary splendour were concerned, he was reminded by it of Defoe. Two or three points in the contribution interested him considerably. One was, that this very large epidemic had demonstrated how easy, under very disadvantageous conditions, it was to deal with pneumonic plague. This had

been the case with smaller outbreaks elsewhere; a priori, from what one knew of the aetiology of the disease, the means of spread of pneumonic plague and the sensitiveness of the plague bacillus, there should be no great difficulty. Although the immediate neighbourhood of the patient was very dangerous, the range of fire compared, say, with small-pox was short. At the time when there was some excitement about plague being introduced amongst the rats in this country he ventured to point out that though only a rat infection, it was a very much more serious matter than if confined to human cases of the pneumonic form, as the latter was easily tackled in a country like this, with all the sanitary organizations which existed; whereas rats were working underground, and it was very difficult to get to windward of them. It was very interesting to learn that the investigators had found no rat plague whatever during the outbreak now described. He believed that the chance of rats becoming infected by eating plague corpses or plague-contaminated material was extremely trivial, and that the whole transfer of rat-plague in Nature from rat to rat was indirectly by means of rat-fleas. He wished to ask Dr. Farrar if dyspnoea was at all striking towards the latter part of the illness. In some of the cases he had seen himself, dyspnoea had been very marked, and to an extent which was quite unaccountable by the amount of pneumonia detectable, and air was entering both lungs perfectly well. Except in cases of pulmonary embolism, he had never seen such severe dyspnoea as in some cases of pneumonic plague.

Fleet-Surgeon W. E. HOME said that members would be glad to hear an account of that large and dangerous epidemic in Manchuria, which caused so much anxiety. In the beginning of the year it was impossible to forecast that the epidemic would stop so suddenly. When Dr. Farrar went out many were anxious as to whether he would come back, because at that time it was a dangerous situation. It was interesting to find the author so confident that the cause of the cessation of the epidemic was the adoption of the sanitary precautions. He remembered in the old days that efforts were made to stop the epidemic of plague in Hong Kong, but at Canton, where nothing of the sort was being done, it stopped a fortnight sooner than in Hong Kong. He asked what was the date of the Chinese New Year. It was well known that the Chinese were very anxious to get back to their own homes by the New Year, and that the gates of the cities were kept open for that purpose. If the New Year was on January 9, and the epidemic began outside Harbin on January 2, it was surprising that the coolies should have been so backward in getting home. One would have thought the Chinamen would have passed there long before. Of course, the incubation period had to be allowed for. He would like to know if the epidemic ceased suddenly in all the places visited by it. It seemed to him as if there was something about the epidemic itself which caused it to cease, though he had not first-hand information, as Dr. Farrar had. As an Indian said a long time ago, "You

make a great deal of fuss about stopping plague, but in time Allah will take it away and one of the sahibs will get the credit for it, and perhaps the C.S.I." Dr. Farrar mentioned a sound system of quarantine. He would be glad to know what that was. If the author were medical officer at Harbin and was afraid that plague was coming through, what would he do? Would he take all the people as they came down, separate them and put them into railway carriages, keeping them there for three or four days or a week, and then if they did not develop anything let them go on?

Dr. W. H. HAMER desired to ask the author about the case of Mrs. Lin. On p. 10 it was stated that "There were circumstantial grounds for believing that she may have acted as a carrier." Dr. Farrar did not say what the grounds were; it seemed that a French paper said Mrs. Lin infected eleven people, but it was now only suggested that she may have infected three. It would be interesting to know what the grounds were for thinking she infected these three. The outbreak now described was practically unique in the recent literature, inasmuch as of all the thousands of cases which had occurred only three were supposed to be infected by a healthy bacillus carrier. It would be a great relief if those three could be got rid of, because, as Dr. Farrar said (p. 3), it was "the limitation of the epidemic, rather than its extension, which required explanation." If one were compelled to believe in healthy bacillus carriers, the difficulty here was much increased. This was, of course, true of all epidemics; as soon as the bacillus carriers became particularly numerous the prevalence came to an end.

Mr. GOADBY said that Dr. Farrar had not given any suggestion as to the way in which healthy persons could act as carriers, and he wondered if, during the bacteriological investigation, the mouths and throats of these persons had been examined in order to learn if they were harbourers of bacilli, as the healthy person was known to carry the diphtheria bacillus. In relation to the bubonic type of plague, he referred to an interesting picture by an old Dutch painter in the Louvre, portraying one of the plagues of Egypt. It was painted in the early part of the seventeenth century, and showed dead rats lying all over the street and in the houses.

Dr. O. KENTISH WRIGHT said it was very striking to one who had not seen plague, that the account of this epidemic seemed to differ markedly from the account which one heard of the Indian bubonic plague, and this made one wonder if the bacillus had been exhaustively investigated with the view of proving its identity with the bacillus of bubonic plague. He would like to hear if rats had been successfully infected artificially, also if the species of rat found in China was the same as that which had been proved to be infected in India. He would be glad if Dr. Farrar would state the conditions under which these cases of plague were nursed in the hospital, particularly

with regard to ventilation. Where he was now working a good deal had been done in the treatment of various acute specific diseases in the open air, in the same way as phthisis was now generally treated. Cases of pneumonia were included in this method. He therefore wondered whether in the hospitals in Manchuria the ventilation was very free, or whether the temperature was too low all the year round to permit this. He asked the question particularly with reference to the danger to the people who were engaged in looking after the patients, because since, at his institution, open-air treatment had been adopted in practically all cases of specific fevers, it was found that the attack-rate on the nurses was very much reduced. In connexion with the safety of those who looked after the cases, he would like to know if inoculation against plague was practised to any great extent.

Dr. BUTLER said he would like to utter his note of scepticism, which had been echoed by others, as to the efficacy of the sanitary administration in terminating the epidemic in Manchuria. If one looked at the diagram exhibited, and remembered what Dr. Farrar said, that at the commencement of the epidemic there was a practical absence of sanitary administration over an area where it would be more difficult to establish it than in any other part of the globe, and contrasted the result—the symmetrical decline in a few months—with what could be obtained in this country with experience and a long-established sanitary service, in dealing with an epidemic whose infectivity was not unlike that described in the paper, there was room for scepticism. We had a disease largely communicated from the expectoration, analogous in its rapid diffusion to measles, or small-pox, breaking out in an unvaccinated community, and when it was remembered how hopeless a task it was to limit epidemics of that kind by the methods which were possible to us here, it would be remarkable if, under the extremely difficult circumstances in China, one could organize a service which would bring about so excellent and rapid a result. Of course, there was the point in favour of such administration that they were dealing with a disease which immobilized almost all who were attacked; there were very rapid effects, and universal death. That undoubtedly made the problem much easier than it would be where there were mild cases, which went about and diffused the disease among others. Still, it was difficult to believe that administrative measures could have achieved what had been depicted.

Mr. T. P. BEDDOES asked what was the explanation of the three suckling children not catching the plague, though their mothers were suffering from it. Was it suggested that the milk had a protective influence? If such an explanation as that were forthcoming, it would be of interest. Or was it simply a coincidence that the children were not infected?

Dr. FARRAR, in reply, said he would try to deal with all the points which had been raised, but as he was not a bacteriologist, nor an expert in any sense, he could not hope to do full justice to some of the questions. Dr. Sandwith

asked the very pertinent question, how did the disease pass from the marmot to man? It seemed highly probable that the disease was started in the human from the marmot in the first instance; but the Conference never had any really definite evidence before it that such was the case. It was considered to be a point requiring special investigation. He asked Dr. Zabolotny how infection might occur, and he said that men handling the skin of infected animals might easily put their fingers in their mouths, and in that way infect themselves. It appeared that the experienced Mongol hunters preferred to run the animal down with dogs in the open. The new hands, however, mostly Shantung coolies, who were not such good hunters, preferred digging down into the burrow of the animal and hauling it out by means of a wire noose round its neck, the idea being to avoid injuring the skin. It was easy to imagine that a plague-infected marmot caught in that way might cough in the face of the captor, and so give him the plague. Still, that problem remained as yet unsolved. After the Conference, Dr. Chwan, Dr. Zabolotny and some assistants, conducted a mixed Russian and Chinese expedition to investigate the problem. Dr. Sandwith also raised the question of the marmot-flea. Dr. Petrie found a special kind of flea on the marmot, which the members of the Conference christened *Pulex Petrii*. But he believed a Russian investigator had already described that particular flea, though Dr. Petrie was not aware of this. At the Conference the question of the human variety of flea was not brought up. Apparently all the experts there—and they included several noted bacteriologists—agreed in discounting the human flea as a factor in the matter. But Dr. Andrew, of Tong Shan, was there, and he worked out the flea prevalence in the bubonic outbreak which they had a year or two back. It was said that the prevalence was in the autumn, and that the rat was a factor. It seemed to him (Dr. Farrar) that the flea prevalence period in Manchuria was not in the winter. Absolute identification of the plague bacillus in the marmot had not yet been effected, he believed, but at Moukden they had several marmots, and investigated them; the Japanese also went into the question. It was found that the marmot was highly susceptible to plague infection, even more so than the guinea-pig. With regard to the kind of mask to wear in the presence of plague, apparently the three-tail gauze bandage covering the mouth and nose, composed of a kind of material which could be burned at the end of the day, was the best. It should not be very thick, as it was very uncomfortable to wear a mask for any length of time. It was absolutely essential for those who would visit patients to wear a mask, as any patient might cough in one's face. In answer to Dr. Sandwith's question, as to what he meant by quarantine, he would say it meant either putting persons in railway carriages, or into a hotel, or otherwise isolating them and watching them for some days, at all events well over the incubation period; that would constitute a very effective quarantine, in his view. The Chinese railway people spent a lot of money in quarantining first-class and second-class passengers at Shanhaikwan. The

quarantine, when once started, was very strict. Dr. Martin had raised the question of the range of fire. Dr. Strong made some crucial and very careful experiments, in which he exposed plates at various ranges, and found that during quiet breathing, and even during dyspnoeic breathing, the plates generally were not infected; but in coughing the bacilli were expelled to a distance of at least 4 ft. He believed Dr. Strong also infected guinea-pigs at various distances from the patient's mouth. What Dr. Martin said about rats was very true. If one had rats to deal with in connexion with plague or other acute infection, it was dangerous; but if a person was ill with pneumonic plague, he was very ill, and soon died; he would not wander about and infect other persons. Moreover, whilst he was ill, once it was known he had plague no one would go near him, and therefore the outbreak would tend to self-limitation. He was glad to hear Dr. Martin's opinion that rats did not get plague by ingestion. It was possible in the laboratory to make rats take plague by ingestion, but he did not believe it was easy even there, and it did not commonly take place naturally. The Russians attached some importance to the fact that human bones had been found in tarabagan burrows, but this did not prove that the animals contracted plague by infection. In answer to Dr. Martin's question about dyspnoea, that symptom was striking in certain cases. Dr. Strong did twenty-five autopsies on plague cases in Moukden, which was interesting, as it was the first time autopsies had been permitted in China, and was a historical fact of some importance. Dr. Strong said that in every case the glands chiefly affected were those at the bifurcation of the trachea. There was also a general lobular infection of the whole of the mucous membrane of the lungs. If the patient lived long enough, there were found to be further lobar changes, and there might be dyspnoea. Dyspnoea was found, but as a rule it was not a very striking feature of the disease; the patients usually passed into a condition of stupor and died before the lungs were profoundly affected. A very soft, compressible pulse seemed to be a very characteristic feature of the disease, and it was not uncommon for patients to die when being raised up in order to be fed. Cardiac failure or collapse occurred from the intensity of the toxæmia.

Fleet-Surgeon Home raised the question of quarantine, and in reply to him he could only say that much depended on the incubation period, which was from two to five days. In Fu-chia-tien they made use of railway carriages. That place was on the Russian railway line. Those who could isolate contacts in groups found it very useful for quarantine purposes. Dr. Hamer challenged him as to the case of their friend Mrs. Lin. Dr. Christie, of Moukden, one of the oldest missionaries in China, related the case of Mrs. Lin. That lady nursed five people, but she made three visits to different families. One of the people she was nursing died in one family. She went to another house and another person was infected, and so in a third family, and it might have been Mrs. Lin who took the infection. There was circumstantial evidence which satisfied Dr. Christie, but the case was never bacteriologically proved.

Mr. Goadby raised a question on what was said in the paper about the range of infection, and about it being against the idea of carriers. Apparently during ordinary quiet breathing it was not easy to infect plates exposed at a distance of 6 in. to 3 ft. from the patient. The bacilli were only expelled by coughing. It was thought that Mrs. Lin might have had a mild attack, and in coughing might have infected the people she visited. It was never bacteriologically proved that Mrs. Lin ever had plague, and it was not proved that she was a carrier. He gave the incident as it was clinically observed. Dr. Kentish Wright asked if the bacillus had been investigated, and wondered whether there was satisfactory evidence that the *Bacillus pestis* was the same as the bacillus which caused the bubonic epidemics. This he would answer emphatically in the affirmative. The evidence satisfied the bacteriologists there, who considered that morphologically, culturally, and in every respect the *Bacillus pestis* observed in the Manchurian epidemic was identical with the bacillus investigated in other outbreaks. Dr. Strong was very definite on the point that it was not *per se* more virulent when injected into guinea-pigs than certain strains which had been isolated from epidemics. There were various strains of plague bacillus, some of which were very mild, but some bubonic strains were very virulent, apparently as virulent when injected into animals as was the Manchurian strain. With regard to the open-air treatment, even if the patients could stand it, he did not think Dr. Kentish Wright would like to visit patients in the open air, especially when the thermometer stood at 40° below zero F. Moreover, there might also be an east wind blowing. In Manchuria on cold days the conditions were terrific. With regard to inoculation, Haffkine's prophylactic was tried a good deal. Dr. Martin inoculated him before he went out, and Dr. Petrie gave him another dose in the train. There was quite a long discussion on that point at the Conference. Galeotti was holding out for his serum, Martini for killed agar cultures, and Haffkine for Haffkine's prophylactic. Certainly many patients who had been inoculated subsequently contracted plague, and died. Marmontoff had been injected three times, Dr. Jackson, he believed, twice. Thirty-two patients inoculated by Haffkine at Harbin contracted plague and died. There seemed to be some evidence that those inoculated were somewhat less liable to take the disease, but he did not think the Haffkine injection was much of a success. If one had been recently inoculated, and in the negative phase, one might, some thought, be even more liable to plague than without such inoculation. He would like Dr. Martin to give the meeting some supplementary information about this. Dr. Strong fought hard for the use of attenuated living cultures. Dr. Strong had had exceptionally good facilities for testing this method. He was Government Surgeon in Manila, and his vaccine was a living culture attenuated with alcohol. After preliminary experiments on guinea-pigs he satisfied himself, as the result of inoculation in 200 criminals who had been sentenced to death, that the attenuated living culture was as harmless as ordinary vaccine for variola.

Sixty-four of these criminals were afterwards inoculated with virulent plague culture and only sixteen died. They voluntarily submitted to the experiment as the alternative of execution. Though the method was not sufficiently appreciated by the Conference, he himself thought it held out great promise, and if he were going to face plague again he would have the attenuated living cultures inoculated. With regard to Dr. Butler's remarks, he thought the members present had scarcely appreciated the fact that he said the crude efforts of the people had done much to protect the people from plague. A person with plague was so ill, and all others had such a fright lest they should take it, that there was very little contact. People would not go near a house where plague was, and when folks were roused, isolation thus effected was as effective as orthodox sanitary measures. In Fu-chia-tien there was a very effective organization; the town was split into four divisions, and no person was allowed to go from one part of the town to another unless he or she had a pass. The divisions were indicated by different colours worn on the sleeve. Shuang-cheng-fu was not a crowded and dirty place, but a large, prosperous Tartar town, with wide streets, yet the plague raged as badly there as it did in the crowded and squalid slums of Fu-chia-tien. In answer to the question of Mr. Beddoes, as to the babies at the breast not getting plague, the two extremes of life seemed to be immune from attack. Possibly these babies did not receive the mothers' sputum, as she would cough over their heads. The Chinese New Year was on January 30 this year.

Dr. C. J. MARTIN, F.R.S., complying with the request for further remarks, said he was interested in the criticisms of Dr. Farrar's statement about the cause of the ending of the epidemic. Dr. Farrar had, however, pointed out that it was the means adopted by the people which put an end to it, quite as much as the measures taken by the authorities. Dr. Farrar might have mentioned the method used by the Buriats in Mongolia, which was, from the standpoint of the public health, an excellent sanitary measure, but rather drastic. If they recognized a case of the disease the patient was sewn up in his tent, and no one went near it until there was no more smoke. When that kind of procedure was operative one did not require medical officers of health. It showed quite a virile public spirit. With regard to the means of vaccination, he thought Dr. Farrar was probably right in his suspicions, that the method advocated by Strong, of using attenuated cultures of living plague, was probably more efficient than any means yet known with dead bacilli. But he (Dr. Martin) did not think there was any future for attenuated cultures. No one would take the responsibility of putting attenuated plague cultures into people so long as one could not guarantee that they might not light up. There was only one culture of plague which he had had, out of several hundred strains, of which he had not been able again to raise the virulence by suitable measures; and while that was so no Government would take the responsibility. One might be sure that there was no reasonable probability of

it doing harm, but if a vaccinated person subsequently contracted plague, it would be attributed to the vaccination. Another question was that concerning the negative phase. He could only speak of it in connexion with rats. In them, with any reasonable vaccinating dose there was no negative phase, and the protection started the next day after the inoculation of a small dose of the contents of the plague bacillus. Therefore, if one could translate those results in the case of rats to man it was safe to vaccinate in the presence of an epidemic; and statistics in villages in India indicated that this was the case. It was very difficult to induce people to be inoculated if there was no plague within 100 miles; it was easier to get them inoculated when the plague had begun; and it was a useful measure in the actual presence of an epidemic. He did not know to what extent one dose of Haffkine's fluid would protect against pneumonic plague; there were no figures available on this point.

Epidemiological Section.

November 24, 1911.

Sir ARTHUR WHITELEGGE, K.C.B., Vice-President of the Section,
in the Chair.

Small-pox in London, 1885 to 1935.

By J. E. SANDILANDS, M.D.

THE history of small-pox in England up to the end of the year 1896 is contained in the reports of the Royal Commission on Vaccination. Appointed in 1884, the Commissioners collected their evidence during those years in which a great change in the annual prevalence of small-pox first became manifest. Fifteen years have elapsed since the publication of the Final Report, and have brought with them an experience which suggests that the changes first noted in the early 'nineties are likely to become permanent.

The returns of the Registrar-General indicate that in London, outbreaks of considerable magnitude recurred regularly every three or four years from 1838 to 1885. In 1886 the mortality from small-pox suddenly fell from 33 (per 100,000) to 1, and did not rise again above 5 for fifteen years.

If the annual fluctuations in the London death-rate are represented graphically, it will be seen that prior to 1886 the longest interval between epidemic peaks extended over a period of five years, from 1872 to 1876. Seven years intervened between the outbreak in 1885 and the only epidemic which occurred in the last decade of the nineteenth century. Eight years represented the interval between the epidemic peaks of 1893 and 1902, and nine years have now elapsed since the last serious outbreak of small-pox in London. The period of freedom from invasion has thus been sensibly lengthened, and a no less striking

feature in the graphic representation of events is the dwarfing of the epidemic peaks when they occur. In the light of former experience the peak of 1893 is negligible, and with this exception the peak of 1902 is lower than any other appearing on the chart. Notification and isolation, exhaustion of the soil by small-pox, vaccination, and attenuation of the virus suggest themselves as the factors to one or more of which these alterations in the magnitude and time-incidence of epidemic outbreaks may have been due.

It will be convenient to discuss first the extent to which the material available for attack has been reduced by the ravages of small-pox in the past.

In the last forty years the mortality from a number of infectious diseases has steadily decreased. By scientists of repute this decrease has been attributed to the operation of natural selection; but before applying Darwin's theory to small-pox in particular, it would perhaps be well to consider first its application to infectious diseases in general. Phthisis was described by Hippocrates, and was prevalent in Greece four hundred years before the Christian Era. More than two thousand years have since elapsed, and fatal phthisis still occurs among the Greeks as it does among other European nations. The first account of Levantine plague refers to an epidemic among the rats of Philistia, in the days of Samuel the Judge who was born about the year 1075 B.C. Three thousand years later plague was still almost constantly present on the Syrian shores of the Mediterranean. If, then, natural selection under circumstances exceptionally favourable to its unfettered operation has failed, in a period of 3,000 years, to produce a plague-proof species of rat it is not likely to have conferred any conspicuous degree of immunity against infectious diseases on civilized man in shorter periods of time. That immunity should not have been produced may be explained by the fact that the operation of natural selection against infectious diseases inevitably tends to defeat its own ends. The total extermination of susceptible individuals before they reproduce themselves can only be attained by ensuring their exposure to infection before the age when reproduction becomes possible. If the first massacre falls short of total extermination, the course of subsequent epidemics is baulked by the presence of immune persons; susceptible members of the community do not come in contact with infection and their numbers consequently increase until epidemic prevalence again becomes possible. If events have, in fact, followed the course suggested, there do not appear to be any grounds for supposing that the application of natural selection to

normal variations in susceptibility could produce an immune race within any measurable space of time. On the other hand, if cases of total immunity were to arise among the lower animals as a mutation or sport, from which regression in the direction of susceptibility was impossible, it is safe to assume that natural selection would preserve such sports at the expense of the original stock and establish an immune race in the lifetime of a few generations.

The suggestion is, that in the absence of discontinuance variation natural selection may produce periods of temporary immunity, to be followed by periods of enhanced susceptibility, but that it is powerless

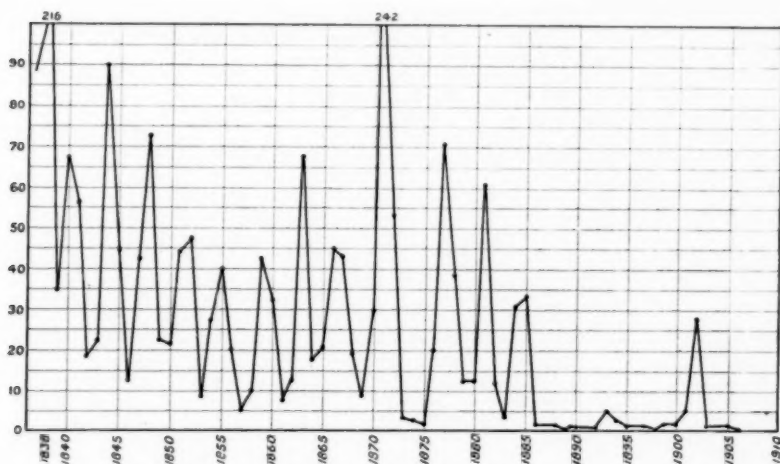


Chart showing deaths from small-pox per 100,000 in registration London, 1838 to 1910.

to produce an immunity which is permanent and absolute. Under these conditions the low mortality from small-pox experienced in the last twenty-five years might be explained by the high death-rate which prevailed in London between 1837 and 1886.

In the years 1857-85, 31,826 deaths were registered in London as due to small-pox. If the case-fatality during this period averaged 20 per cent., then some 127,000 persons of various ages suffered from non-fatal attacks and survived as immune members of the community. Of this number, on the most liberal estimate, not more than 50,000 could have been present among the London population in 1886, at ages between 15 and 30 years. From the mean populations given by the

Registrar-General for the decennium 1881-1891 [4], the number of persons aged 15-30 years, living in London in 1886, may be roughly estimated as 1,150,000. Of those below the age of 15 years, in the latter year a large proportion were still protected by infantile vaccination. Of those aged 15-30 it will be seen that only one in every twenty-five had been rendered immune to small-pox by a previous attack. Unless we assume that large numbers of those who escape infection do so by virtue of a natural immunity, the presence of protected persons among a susceptible population in the proportion of 1 to 25 could hardly be held to have been an important factor in producing the sudden cessation of epidemic small-pox which occurred in 1886.

If we turn to remoter times and neglect a priori objections, it is possible to imagine a period of devastation when the law of the survival of the fittest preserved the naturally immune, at the expense of the susceptible, in overwhelming numbers to produce children who enjoyed the same inherited protection against small-pox. Such a period may have existed, but even so, the fact remains that if successful vaccination implies previous susceptibility to small-pox, the birth of naturally immune children, whatever it may have been in the past, is now an exceedingly rare event.

On the whole the available records of the behaviour of infectious disease in past years appear to justify the following conclusions, namely:—

(1) That natural selection does not tend towards any permanent reduction in the prevalence of small-pox and other infectious diseases.

(2) That the evidence available does not justify the assumption that the recent fall in the death-rate from small-pox, phthisis, and other infectious diseases has been due to the production by natural selection of a period of temporary immunity.

(3) That if by coincidence temporary immunity against several diseases has been produced at the same time, the death-rates from all will rise again to their former level unless an effective check is provided by some other agency.

VACCINATION.

In the reduction of the prevalence of small-pox the part played by vaccination depends directly on the duration of the protection it confers, and this, unfortunately, is an unknown quantity. At the same time,

there would appear to be grounds for the belief that the available data, notwithstanding their grave deficiencies, still justify a higher tribute to the lasting effects of vaccination than was paid by the Commissioners.

The method here adopted for the purpose of throwing light on this question of duration consists in an attempt to estimate the relative incidence of small-pox in early adult life on the vaccinated and unvaccinated persons who were present in London during the 1902 epidemic. The first step has been to assume that the proportion of vaccinated to unvaccinated persons living at the ages 15 to 30 within the Metropolis in the year 1902 was the same as the proportion that obtained among persons at the age of 1 year who were born in London in the years 1873-87. That the application of this hypothesis in calculating the incidence of small-pox would probably exaggerate the liability of the vaccinated by under-estimating the numbers available for attack may be inferred from the following considerations. In the first place, large additions can at any time be made to the vaccinated members of a community, whilst nothing can diminish their numbers except death and migration. Conversely, nothing can add to the ranks of the unvaccinated save immigration, whilst their numbers may at any time be seriously depleted by vaccination. The effects of death and migration may be neglected, since the proportion of vaccinations to births in the rest of England has always been higher than in London, and the incidence of death on the two classes, if death from small-pox be excepted, has in all probability been equal. If inequalities have occurred, there is in any case no reason to suppose that they have been in the direction of a heavier death-rate among the vaccinated community.

The proportion of vaccinated to unvaccinated persons born in London in the years 1873-87, and surviving to the end of the first year of life, is shown in the following table:—

TABLE I.—PROPORTION OF VACCINATED TO UNVACCINATED PERSONS BORN IN THE YEARS 1873-87 AND SURVIVING TO THE END OF THE FIRST YEAR OF LIFE.

Age in 1902	Year of birth	Of 100 surviving one year the number		
		(A) Vaccination	(B) Assumed to have survived unvaccinated	(C) "Not finally accounted for," L.G.B. Returns
15-20	1883-87	91	9	7
20-25	1878-82	92	8	7
25-30	1873-77	90	10	8

The percentages in the fourth column exceed those supplied by the Local Government Board under the heading "Not finally accounted

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for," because allowance has been made for the deaths which took place before vaccination, whereas the Local Government Returns make no allowance for deaths, and express the percentages for each year in proportion to the total births.

In the next table the London population at the ages 10-30, as given in the census for 1901, has been adopted without alteration for the year 1902, and the numbers of vaccinated and unvaccinated persons have been obtained by applying the percentages already given to the populations in the age-periods to which they belong.

TABLE II.—LONDON: VACCINATED AND UNVACCINATED PERSONS LIVING AT AGES 10-30 IN THE YEAR 1902.

Age-period		Population in 1902		Vaccinated		Unvaccinated
10-15	...	419,586	...	—	...	—
15-20	...	441,833	...	402,068	...	39,765
20-25	...	477,916	...	439,683	...	38,233
25-30	...	438,329	...	394,497	...	43,832

For the four five-yearly age-periods between 10 and 30 the number of vaccinated and unvaccinated persons admitted with small-pox to the hospitals of the Metropolitan Asylums Board in the year 1902 is shown in the following table, which also gives the number of small-pox patients whose state of vaccination was classed as doubtful.

TABLE III.—NUMBER OF SMALL-POX PATIENTS AT SEVERAL AGES ADMITTED TO THE HOSPITALS OF THE METROPOLITAN ASYLUMS BOARD IN 1902.

Age-period		Number of patients, all classes		Vaccinated		Unvaccinated		Doubtful
10-15	...	603	...	265	...	311	...	27
15-20	...	881	...	654	...	191	...	36
20-25	...	1,209	...	1,049	...	123	...	37
25-30	...	1,139	...	1,017	...	80	...	42

From the data given in the two preceding tables the incidence of small-pox at ages between 15 and 30 has been calculated with the following results.

TABLE IV.—INCIDENCE OF SMALL-POX IN VACCINATED AND UNVACCINATED PERSONS ON THE VACCINATED AND UNVACCINATED POPULATIONS, LONDON, 1902.

Age-period	..	15-20		20-25		25-30	
State of vaccination ..		Vaccinated	Unvaccinated	Vaccinated	Unvaccinated	Vaccinated	Unvaccinated
Case-rate per 10,000 of population ...		16	48	...	24 32	...	26 18

The cases of small-pox in persons whose state of vaccination was classed as "doubtful" are not included in the above table. The figures indicate that the incidence of small-pox on the vaccinated is still considerably less than it is on the unvaccinated, even in the age-period 20-25, and if, as is claimed, the method adopted understates the proportion of vaccinated persons at all age-periods, then the duration of the protective effect of vaccination for twenty years has been demonstrated. In support of this claim attention may be drawn to the fact that the calculation employed has represented the unvaccinated at the ages 25-30 to be considerably less liable to attack than the vaccinated, and this anomaly is, in itself, sufficient to suggest that in this age-period and its predecessors the proportion of the vaccinated to the unvaccinated members of the community has been over-estimated.

The vaccination returns which are published annually by the Local Government Board show that during the years 1874-1901, in addition to the subjects of statutory vaccination in the first year of life, no less than 94,423 persons in London were transferred from the unprotected to the protected class by primary vaccination performed by the Public Vaccinator at ages of 1 year and upwards. Clearly some allowance must be made for this wholesale defection from the ranks of the unvaccinated London population, and it remains to consider the methods available for estimating the numbers to be deducted. Six calculations have been made, and assume with one exception that the persons vaccinated in London at various ages in the years 1874-1901 all survived, and were all present in London during the 1902 epidemic.

METHOD I.

Period	Total primary vaccinations after infancy	Number of persons vaccinated	Age when vaccinated	Date of birth	Age in 1902
1874-78	17,134	17,134	1 year	1873-77	25-30
1879-83	16,286	16,286	"	1878-82	20-25
1884-88	14,296	14,296	"	1883-87	15-20
1874-88	47,716	47,716	"	1873-87	15-30

METHOD II.

Date of vaccination at age of 1 year	Number of persons vaccinated	Number surviving in 1902	Age of survivors in 1902
1874-78	17,134	14,044	25-30
1879-83	16,286	13,751	20-25
1884-88	14,296	12,354	15-20
1874-88	47,716	40,149	15-30

Method I assumes that all primary vaccinations after infancy were made between the ages of 1 and 2 years. On this hypothesis it follows that in 1902 the number of subjects of primary vaccination after infancy who were present in the London population at ages between 15 and 30 would be the same as the number of primary vaccinations performed in the years 1874-80.

Method II.—The figures obtained by Method I have in Method II been corrected by deducting the number of subjects of primary vaccination after infancy who may be assumed to have died before reaching the age-period 15-30. The results arrived at by these two methods have been shown on previous page.

The figures in the second column and the first line of the table headed Method II represent 17,134 persons aged 1 year who were vaccinated at ages between 1 and 2 years. The figures 14,044 in the third column represent the number out of these 17,000 who would have survived had their expectation of life been the same as that of persons living in England and Wales in the years 1881-90. The figures for the ages 20-25 and 15-20 have in the same way been obtained by the application of Dr. Tatham's Life Table [3] for the years mentioned.

TABLE V.—NUMBER OF PERSONS VACCINATED AFTER INFANCY AND SURVIVING AT AGES 15-30 in 1902.

Number of method		Ages of persons at date of vaccination	Ages in 1902 of persons vaccinated after infancy		
			25-30	20-25	15-20
III	...	1-11 years	17,892	14,070	13,484
I	...	1-2 "	17,134	16,286	14,296
IV	...	1-21 "	15,688	15,796	13,439
V	...	1-31 "	14,923	11,770	8,958
II *	...	1-2 "	14,044	13,751	12,354
VI	...	1-41 "	11,192	8,828	6,719

* Method II gives the results which have been obtained by correcting the figures under Method I for loss by death.

The next calculation has been based on the assumption that the total primary vaccinations after infancy in any given year were limited to and divided equally amongst persons aged 1 to 11 years, so that the number of persons vaccinated in any year of life between these limits was equal to one-tenth of the total number of primary vaccinations performed. For the purpose of reference the use of this assumption may be described as Method III. Methods IV, V, and VI resemble Method III, with this difference, that the post-infantile primary vaccinations in each year have been distributed over the age-periods 1-21, 1-31,

and 1-41 respectively. The results of the application of these several methods have been set out above in the order of the magnitude of the numbers in the age-period 25-30, since it is in this period alone that large deductions from the unvaccinated population will materially affect the question as to the maximum duration of the immunity conferred by infantile vaccination.

In choosing between the various methods employed, it is clear we must reject any calculation which gives a comparatively high figure in the age-period 25-30 unless allowance is made for loss by death. Time has not been available for the labour which the application of the necessary correction to some 700 different sets of figures would entail. It is accordingly proposed to use the results obtained by Method VI, which assumes the distribution of primary vaccinations after infancy over the age-period of 1-41. This decision has been arrived at on the grounds that Method VI gives the lowest numbers at all age-periods, and that without correction for loss by death it still underestimates the number which should fall in the critical age-period 25-30. It is claimed that a very large majority of primary vaccinations after infancy may be assumed to be performed before the age of 25 years, and the contention that the estimate under Method VI is too low is supported by the results of the other methods which show that considerably higher figures are obtained when the vaccinations are distributed over and confined to the earlier ages at which they were in all probability performed.

If, then, the vaccinated and unvaccinated populations set forth in Table II are corrected by the transference of the persons assumed under Method VI to have passed from the unvaccinated to the vaccinated state, the following populations will be obtained.

TABLE VI.—CORRECTED VACCINATED AND UNVACCINATED POPULATIONS, 1902.

Age-period	Population in 1902			
	Vaccinated		Unvaccinated	Both classes
15-20 ...	408,787	...	33,046	441,833
20-25 ...	448,511	...	29,405	477,916
25-30 ...	405,687	...	32,640	438,329

Unfortunately the figures given in the above table for the vaccinated populations cannot stand because they presumably include persons who, in the year of the epidemic, were immune to small-pox by virtue of recent first or second vaccinations, and who were, in consequence, not available for attack. If, then, the average duration of absolute protection is taken to be fifteen years, it becomes necessary to make a further

correction in the vaccinated population by deducting all those who may be assumed to have been re-vaccinated, or vaccinated for the first time, since the year 1886, and consequently less than sixteen years prior to the epidemic year.

The number of re-vaccinations performed by the Public Vaccinator in the years 1887-1901 were 46,206. If the re-vaccinations in each of these years were distributed in equal numbers among persons at the ten ages between 15 and 25 years, the following number of persons at the ages shown in the table would have been immune to small-pox in 1902 by virtue of re-vaccination within the preceding fifteen years.

TABLE VII.—PERSONS LIVING IN LONDON IN 1902 AND RE-VACCINATED BY THE PUBLIC VACCINATOR WITHIN THE PRECEDING FIFTEEN YEARS.

Age in 1902	Number of persons
15-20	4,340
20-25	14,480
25-30	15,336
15-30	34,156

Of the persons vaccinated after infancy for the first time and transferred from the unvaccinated to the vaccinated population, the following number in whom the operation is shown by the data used in Method VI to have been performed after the year 1886 must be deducted. The total deduction to be made from the vaccinated population on account of recent first and second vaccinations will then be as follows.

TABLE VIII.—PERSONS VACCINATED AFTER INFANCY SINCE 1886.

Number of persons vaccinated after infancy since 1886					
Age in 1902	Primary vaccinations	Re-vaccinations	Total number vaccinated		
15-20	6,270	4,340	10,610		
20-25	6,320	14,480	20,800		
25-30	6,320	15,336	21,656		
	18,910	34,156	53,066		

The next table shows the vaccinated populations remaining when the necessary deductions have been made for the above primary and secondary vaccinations; and for convenience the unvaccinated populations already given are repeated.

TABLE IX.—VACCINATED AND UNVACCINATED POPULATIONS AVAILABLE FOR ATTACK IN 1902.

Age-period	Population in 1902, available for attack by small-pox			
	Vaccinated		Unvaccinated	
15-20	...	398,177	...	33,046
20-25	...	427,711	...	29,405
25-30	...	384,033	...	32,640

The results obtained by calculating the incidence of small-pox on these populations are shown in the table which follows, and includes for purposes of comparison the uncorrected results already quoted.

TABLE X.—INCIDENCE OF SMALL-POX IN VACCINATED AND UNVACCINATED PERSONS IN THE VACCINATED AND UNVACCINATED POPULATIONS, LONDON, 1902.

Age-period	15-20				20-25				25-30				
State of vaccination	Vaccinated		Unvaccinated		Vaccinated		Unvaccinated		Vaccinated		Unvaccinated		
Incidence	Uncorrected	16	...	48	...	24	...	32	...	26	...	18	
per 10,000	Corrected	...	16	...	58	...	25	...	42	...	27	...	25

It may be noted here, lest it should be supposed the point had been lost sight of, that the presence in the population of persons immune to small-pox by virtue of a previous attack may be neglected. Their number at the age-periods under consideration probably fell short of 10,000; the allowance to be made is of less weight because the deductions would be from both sides of the equation, and a calculation involving some labour has shown that their inclusion would not materially alter the incidence we have now arrived at.

According to the corrected figures the incidence of small-pox on the unvaccinated in the age-period 15-20 is considerably more than three times as heavy as it is on the vaccinated. In the age-period 20-25 the incidence is still more than half again as great on the unprotected class. After the age of 25 the protective effect of infantile vaccination against attack by small-pox appears to have vanished. This levelling up of the two classes in the last age-period is represented by the figures given as having been largely, though not wholly, due to the diminishing incidence of small-pox on the unvaccinated community from the age of 15 onwards. Since it is important to determine whether this diminished incidence is real or only apparent, the age-distribution of unvaccinated patients admitted with small-pox to the hospitals of the Metropolitan Asylums Board in former years is given in the following table, which also shows the incidence of small-pox among patients whose condition as regards vaccination was doubtful.

TABLE XII.—STATE OF VACCINATION OF SMALL-POX PATIENTS ADMITTED TO THE HOSPITALS OF THE METROPOLITAN ASYLUMS BOARD.

Age-period	Number of unvaccinated patients			Number classed as doubtful		
	1873-84	1902	1901	1873-84	1902	1901
10-15 ...	317	311	75	214	27	2
15-20 ...	204	191	42	205	36	8
20-25 ...	174	123	27	167	37	12
25-30 ...	105	80	14	116	42	7
	800	705	158	702	142	29

The close resemblance between the figures given by Dr. Gayton [1] in former years and those for the year 1902 renders it almost superfluous to give the following table, which shows the proportion of cases in each age-period when the total cases at the ages 10-30 are represented as 100.

TABLE XIII.—PROPORTION OF UNVACCINATED PATIENTS AT SEVERAL AGES IN 100 PATIENTS AT AGES 10-30.

Age-period	Years of admission		
	1873-84	1901	1902
10-15 ...	40	47	44
15-20 ...	26	27	27
20-25 ...	21	17	18
25-30 ...	13	9	11
	100	100	100

The table shows that in the 'seventies and early 'eighties the rapid fall in the incidence of small-pox from the age of 10 years onwards was practically the same as in 1902. Further, in Dr. Gayton's figures it is evident that the addition of the "doubtful" cases to the unvaccinated would not make any material difference, since the age-distribution and numbers in the two classes are strikingly alike. In the year 1902, however, the combined numbers for the two classes in the age-period 25-30 would represent the incidence after the age of 25 to be the same as the incidence among unvaccinated patients aged 20-25. Under these circumstances it might be supposed that the small numbers in the unprotected class at later ages resulted from the inclusion of unvaccinated persons in the "doubtful" category.

If the vaccinated small-pox patients admitted to the hospitals of the Metropolitan Asylums Board during the years 1901-02 are classified according to the number of vaccination marks observed, the following results are obtained.

TABLE XI.—SHOWING THE AGE-INCIDENCE OF 7,381 VACCINATED CASES OF SMALL-POX, CLASSIFIED ACCORDING TO THE NUMBER OF THE VACCINATION SCARS OBSERVED, AND OF 2,878 UNVACCINATED CASES. EACH CLASS IS REPRESENTED AS CONTAINING 100 CASES.

Number of scars	Age on admission							All ages
	Under 10	10	20	30	40	50 and upwards		
Four or more	2 ...	22 ...	44 ...	21 ...	8 ...	3 ...		100
Three	1 ...	15 ...	35 ...	31 ...	13 ...	5 ...		100
Two	2 ...	11 ...	27 ...	29 ...	19 ...	12 ...		100
One	3 ...	13 ...	27 ...	24 ...	20 ...	13 ...		100
Scars absent	8 ...	20 ...	21 ...	16 ...	13 ...	22 ...		100
Unvaccinated	56 ...	27 ...	10 ...	4 ...	2 ...	1 ...		100

The figures in this table are quite incomprehensible except on the assumption that vaccination scars gradually become obliterated with the lapse of time. Thus the incidence on those with four scars at the age of 30 is suddenly reduced to half the incidence in the previous ten years, whereas the number of patients with two scars at the same age is actually increased. The difference is obviously due to the fact that after the age of 30 numbers of persons who originally bore four or more scars pass into the three- or two-scar class. The "doubtful" class, consisting of persons who stated they had been vaccinated but who presented no scars, shows the age-distribution of small-pox which would be expected among a community of vaccinated persons in whose number a small proportion of unvaccinated subjects had been included. The comparatively high incidence in early life is due to the inclusion of unvaccinated persons, and dwarfs the proportionate numbers in the age-periods between 20 and 40. At the same time, the rapid diminution which should have occurred at the latter ages had the class under consideration consisted wholly of unvaccinated persons does not take place. The obvious inference is that the large increase in the scarless vaccinated population which undoubtedly accounts for the high figure in the last age-period has also operated in earlier years and prevented any sudden diminution in numbers after the age of 20 by adding to the doubtful class persons whose statement as to vaccination was true but whose vaccination scars had become obliterated. It would accordingly appear that the proportion of vaccinated to unvaccinated persons in the doubtful class increases with age. If the correctness of this conclusion be accepted it follows that the incidence of small-pox on the unvaccinated class at the age-period 25-30 would not be materially increased by the addition of the negligible number

of unvaccinated patients who may be assumed to have been wrongly classified. We may accordingly accept the Metropolitan Asylums Board's estimate of the age-distribution of unvaccinated small-pox patients as approximately correct and as indicating that the diminution of numbers with age must be either due to shrinkage in the unvaccinated population or to natural immunity in later life.

In the first case, it would follow that the figures in Table X grossly underestimate the incidence of small-pox on the unvaccinated in the age-period 25-30, and further that if the estimate put forward were to be substantially increased the protective effect of vaccination against attack by small-pox would be shown to exist for more than twenty-five years. In the second case the incidence shown in the table may stand unaltered as evidence that after the twentieth year of life unvaccinated persons become less susceptible to attack by small-pox and that this measure of immunity steadily increases as they grow older. Attention has already been drawn to the figures in the table which suggest that up to the age of 20 the attack-rate among the vaccinated is less than one-third of the rate prevailing among the unvaccinated, and so we arrive at an important conclusion, viz., that infantile vaccination continues to exert a well-marked protective effect against attack by small-pox until an age is reached at which natural susceptibility has already begun to decline with advancing years.

Assuming that these two preventive influences do in fact overlap in the manner suggested, the cessation of small-pox epidemics in London between the years 1884-93 may well have been due, in the first instance, to the vaccination in infancy of 90 per cent of the population during the years 1873-87. From the year 1887 onwards the proportion of children not finally accounted for in regard to vaccination continued to rise until in 1898 it was returned as equivalent to 33 per cent. of the births registered in London during that year. If, then, vaccination was in the first instance largely responsible for the initiation of the first prolonged inter-epidemic period, it cannot in any case be held to account for the altered periodicity of small epidemics in more recent years.

NOTIFICATION AND ISOLATION.

Down to the year 1870, 100 beds in the Highgate Hospital constituted the sole specific provision in London for the isolation of small-pox patients[2]. In 1877 only 6,516 small-pox patients were admitted

to the hospital of the Metropolitan Asylums Board, although the total number of cases occurring in London probably exceeded 13,000. (The deaths registered as due to small-pox in the same year numbered 2,500, the fatality in hospital being equivalent to 18 deaths among every 100 patients admitted.) The returns for the year 1885 show that out of 1,317 deaths from small-pox 265 still took place in persons who had not been removed to the Board's hospitals, but from this time onwards beds have been available for every case of small-pox occurring in the Metropolis. In the words of the Commissioners, "It is impossible not to be struck with the fact that it is since the year 1885 that the Metropolis has presented so satisfactory an aspect as regards small-pox mortality. The facts . . . certainly seem to point to the conclusion that this has been due to a system of isolation, well organized and administered. . . ." [2].

This conclusion was arrived at by the Commissioners in the year 1895, since when the percentage of children born in London, and not finally accounted for as regards vaccination, has varied between 19 and 33 per cent. as compared with variations between 7 and 21 per cent. in the ten years 1885-94. In view of the substantial increase in the number of susceptible members of the community, which this state of things implies, the question naturally arises as to whether the influence of notification and isolation which proved itself to be effective in the years 1886-95 is also to be held responsible for the prevention of small-pox epidemics in later years.

The value of notification is subject to the serious limitation that the information in the case of small-pox necessarily relates to an event which has happened fourteen days before the news is received. At the best under these circumstances a missed case revealed by the inquiries which follow notification can only be isolated after spreading infection broadcast for at least two weeks. At the worst the unavoidable lapse of time renders it impossible to trace the original source of infection. Even in epidemics which are altogether insignificant from the point of view of the numbers attacked cases that cannot be traced to their source occur at an early stage, and when the number of such cases amounts in a short time to a dozen or more it is perhaps permissible to inquire whether the abortion of the epidemic is not due to the impotence of a feeble virus rather than to isolation.

In larger epidemics isolation is manifestly incapable of stopping the general trend of events, although it necessarily succeeds in limiting their magnitude. Thus before the end of 1901, 1,700 cases of small-pox had

been notified in London, and every known measure for preventing a further spread of the disease in the ensuing year had been adopted. And yet in the month of March the number of patients admitted to the hospitals of the Metropolitan Asylums Board amounted to 1,900, and exceeded the number of admissions in the whole of the last quarter of the previous year. It is also to be noted that the mortality from small-pox reached its maximum in the fifteenth week of the year, that is to say, only five weeks before the average time at which the mortality from small-pox had reached its maximum during the past seventy years.

Isolation did not prevent the death-rate from continuing to rise according to the laws of previous epidemics, neither can it take the credit of the fall because it occurred some few weeks before the appointed season.

The conclusion to be drawn is that if at any time in the future a highly infectious virus succeeds within a few months in securing some thousand odd victims, isolation cannot be relied on to prevent the occurrence of an epidemic of far greater magnitude than that of 1902. On the other hand, there can be no reasonable doubt that prompt isolation during the past twenty-five years has cut short at the outset minor epidemics, which under the regime that existed in the early 'seventies would inevitably have continued to occur with the same frequency that was experienced before provision had been made for the removal of patients to hospital. Under these circumstances the only outstanding question is as to whether these successes have been against an infection of the same virulence as that which prevailed in the early 'sixties and 'seventies, and again in the year 1877.

THE VIRUS OF SMALL-POX.

If reference is again made to the chart which illustrates the fluctuations in small-pox mortality which have occurred since 1838, a period of fourteen years will be seen to intervene between the considerable outbreaks which occurred in 1848 and 1863. During the whole of this time the highest death-rate from small-pox recorded was 48 per 100,000, the next highest being 45 and 42, as compared with rates of 70 at the beginning and end of this period of diminished prevalence. That the numbers attacked in previous years had been altogether insufficient to confer any material degree of immunity on the population may be gathered from the fact that the unprecedented death-rate of 242 recorded in 1871 did not prevent the occurrence of a rate of 70

within six years during the 1877 outbreak. In the period under consideration hospital isolation had not been introduced, and the comparatively low mortality from small-pox can consequently only be explained by the fact that during these years the infective agent was lacking in virulence.

The chart further shows two strikingly similar periods of steadily falling prevalence. The first extends over a period of twenty-four years, from 1838 to 1862. The second fall, beginning in 1872, gives a curve which is almost identical in form up to the year 1886. From this year onwards minor fluctuations have been obliterated by hospital isolation, but even so, the second period of diminished prevalence is still comparable to the first, in that it extends over a space of more than twenty years, to be checked by the epidemic of 1893. Nine years later the major epidemic of 1902 occurred, and it is of interest to note that the 1863 outbreak which checked a fall extending over twenty-four years was followed within eight years by the major epidemic of 1871. The intervals separating the major outbreak in 1871 from those of 1838 and 1902 were thirty-two and thirty years respectively.

The outstanding features in the prevalence of small-pox prior to the year 1870 owed their prominence to the occurrence of long periods during which the infective powers of the virus of small-pox continued to fail. The course of events as illustrated by the chart admits of no other explanation. From the year 1870 onwards other powerful influences have been at work, but there is nothing in the nature of these influences which would justify the conclusion that the virus of small-pox has not continued as in former years to pass through extended periods of lowered infectivity. If, then, we assume that succeeding generations of the virus in more recent times have shown the same variations in infective power that are known to have occurred before the days of hospital isolation, the following suggestions may be put forward as a tentative explanation of the behaviour of small-pox in London during the last twenty-five years:—

(1) In the first place, the freedom of London from small-pox epidemics during the whole of this period, if the years 1893 to 1902 be excepted, has been mainly due to the effects of notification, with its natural sequel, isolation, on a population which includes more than 75 per cent. of vaccinated persons.

(2) It is probable that the success of notification has been in no small measure due to the fact that during the greater part of the period under consideration the infective powers of the virus of small-pox have

fallen short of the standard necessary for the production of a major epidemic.

(3) Reasons are not wanting for the belief that, in the vast and complex community of the Metropolis, notification, and the isolation of all known cases of small-pox, cannot cut short an epidemic which is due to the presence of a highly infectious virus.

(4) History suggests that after a major epidemic the infective power of the virus of small-pox continues to fall for twenty years. At the end of this time recovery ensues, and after thirty years the infective agent has again attained to a maximum degree of virulence. On this hypothesis the epidemics which occurred in London in 1893 and 1902 may be explained, and in the future epidemic outbreaks may be expected in some year between 1920 and 1925, and again in the first half of the decennium 1930-1940.

REFERENCES.

- [1] Report of the Royal Commission on Vaccination, 1890, ii, App., p. 242.
- [2] *Ibid.*, Final Report, p. 119.
- [3] Supplement to Fifty-fifth Report of the Registrar-General, 1895, p. xiv.
- [4] *Ibid.*, pp. 6, 7.

DISCUSSION.

Dr. FRANKLIN PARSONS considered that the Section was much indebted to Dr. Sandilands for his care in preparing the paper. The prevalence of an epidemic disease such as small-pox in a community like London might be thought of as the resultant of three factors: one was the presence of the specific infection; another was the degree of susceptibility present among the community; the third consisted of the facilities which existed for the infection coming into contact with susceptible individuals. With regard to the presence of the infection, Dr. Sandilands had omitted to mention one most important circumstance, namely, that in the year 1885—viz., that in which the sudden diminution of small-pox in London took place—the cases of small-pox were no longer treated in hospitals in the middle of London, but were removed into Kent. Since that time small-pox in London had shown a different behaviour from that which obtained before. Previously to 1885 the behaviour of small-pox resembled that of one of the infectious diseases which were always present, such as measles, which recurred in regular peaks every three or four years—occurrences which might be due to accumulation, in the interval, of susceptible individuals. After the great epidemic of 1870 there was a longer interval than usual owing to the soil having been exhausted, and it was a longer time before a sufficient amount had accumulated to start an epidemic again. But after the removal of the cases of small-pox out of London there was no such behaviour, though there were recurrences in 1893 and 1902. The latter one was due to an infection imported from Paris, into a laundry, and it had got a good start before its presence was known. In that case the virus was of a particularly potent kind. It happened that in the North of England there was small-pox at the same time, which had been imported from America, and that imported strain was a very mild one. In one town in Lancashire there were outbreaks from two sources concurrently; one could be traced to the cases imported from America, of a mild type, while another was traceable to the infection which had come across from Paris via London, and that was severe. This seemed to show that the virulence of small-pox did not depend on cyclical changes in periods of years, such as might be thought to be due to sun-spots or something of that kind, but to the contagion having been cultivated to a high degree of virulence by favourable conditions. The idea was that the high virulence of 1870, not only in this country, but all over Europe, was due to the conditions which existed in the troops at the time of the Siege of Paris, when a number of cases had been brought together, which raised the infection to a high degree of virulence. The same thing had been suggested by Sir William Power with regard to the small-pox hospitals when they were in London—viz., that the aggregation of cases, by a process comparable to cross-fertilization in plants and animals, increased the potency and rendered these hospitals dangerous by producing in them a strain of higher virulence than would have occurred otherwise. It might be that the

conditions of the hospitals were better now in that regard than when the hospitals were in London itself, owing to there now being more fresh air and open space, although Dr. Buchanan's observations on small-pox in Essex showed that they still were able to produce a strain which would carry to a considerable distance. Since small-pox hospitals had been removed out of London the recurrent epidemics at regular intervals had ceased and recently London had been practically free from the disease; for five years before 1911 there had been almost no deaths from small-pox in London. Therefore at the present time the infection might be regarded as practically non-existent in London. Although there were large numbers of susceptible unvaccinated children, they did not get small-pox, because the infection was not there for them to come into contact with. But if a case were to come in under circumstances in which it was not traced, and had spread infection over considerable areas before it came to the knowledge of the authorities, it was very probable that an epidemic might arise again. It was a question of the occurrence of favouring circumstances rather than of recurrence in cycles.

He did not follow Dr. Sandilands's calculations as to the proportion of unvaccinated persons compared with the vaccinated in the community at later ages. He did not know whether the author was aware how the statistics of the Local Government Board were compiled. The vaccination officer had to send in each year two half-yearly returns and one supplementary yearly return of the children whose births were registered in his district during the respective periods, and their state in regard to vaccination. At any rate, that was so during the time to which Dr. Sandilands referred. The yearly and half-yearly numbers were of the children whose births were registered, not of those who were born during the period, so that some of the children recorded in the supplementary annual return were more than a year old. It might be a month or six weeks after birth that the child was registered, so that some of those who were registered in 1909 might have been born in November or December, 1908. Those registered during the second half-year of 1909 would be first entered in the half-yearly return which was sent in in August, 1910. In February, 1911, a half-yearly return would be sent in giving the number of births which were registered in the first half-year of 1910, and a supplementary return for the year 1909; so that some of the children whose births were recorded in that supplementary return might be two and a quarter years old. After that, the Board had no means of knowing whether they were vaccinated or not. In addition to the returns sent in by the vaccination officers there was a return of vaccinations performed at the cost of the Poor-rates, and in that return the number of the persons who were vaccinated above and below one year of age was distinguished. But that return referred only to the public vaccinations, and in addition to those there were a number which were performed privately. Persons vaccinated privately were accounted for in the returns sent in by the vaccination officer, but would not be accounted for in the returns of public vaccinations which were sent in by the clerks to the guardians. The vaccinations after the first or second year of life were

not distributed equally over a term of years, say from one to forty years, but took place at three periods particularly. A certain number which were missed in the early years of life would be followed up by the vaccination officer, and the vaccination would be done in the second or third year, and after that, if missed, they would probably be allowed to slip. But there came a time when many of those entered the Public Services, such as the Post Office, or perhaps they entered the Army, or emigrated, or were in a position in which a certificate of vaccination was required. That would occur at about 15 years of age, at which age, therefore, another batch of persons would be vaccinated. Again, if an epidemic of small-pox should break out, as it might at any time, any who were over 10 years of age might be re-vaccinated, and any who had not been re-vaccinated or who had unsatisfactory marks of primary vaccination might be vaccinated at the public cost. So, on the occasion of a small-pox outbreak, a large number of vaccinations were performed on people who had escaped vaccination in early periods of life. All those points made it difficult to calculate the number of persons vaccinated and unvaccinated at different periods of life. But in view of the private vaccinations, which Dr. Sandilands apparently had not taken into account, Dr. Parsons thought the number of vaccinated persons must be considerably larger than the figures showed. No doubt vaccination scars did disappear in course of time. Re-vaccination scars soon disappeared, but the scars of primary vaccination were more permanent. Still, those got less distinct in process of time, and they might disappear altogether. But the effect of that would be, not to remove the case from the four-scar to the three-scar class, but to remove it from the four-scar class to the doubtful class. Another thing which might account for the diminution in the number of four-scar cases in the later period of life was, that it was not until 1887 that the production of four scars in public vaccinations was insisted on by the Local Government Board. In the earlier years the Board's instructions required an area of half a square inch to be involved in the vaccination, but they left it optional to the public vaccinator whether he produced that area by one, two, three, four, or a larger number of marks. So the larger number of marks in the more recently vaccinated persons might be due to the Board's instructions having been made more explicit. With regard to the one-scar vaccination, during recent years there had been a great development of cheap one-mark vaccination by "sixpenny doctors" in many parts of the country. That would rather tend in the other direction, but the tendency would be for the vaccination to be either four marks by the public vaccinator or the one mark of the private practitioner.

Dr. BUCHANAN said he had listened with very great interest to the paper, and he thought the Section should be grateful to Dr. Sandilands for the great trouble which he had taken in collecting and analysing the data which he had handled in the contribution and endeavouring to extract conclusions from them. The points on which he had intended to speak had been largely covered by

Dr. Parsons, with whose remarks he agreed. The title of the paper was "Small-pox in London, 1885 to 1935," but it had been necessary to go considerably further back than 1885, and the most conspicuous thing to which the author drew attention was the intensity of small-pox mortality in London before 1885, and the remarkable change which took place after that year. In considering the causes of the sudden drop, Dr. Sandilands mentioned notification and isolation, exhaustion of soil by small-pox, vaccination, and attenuation of the virus. He admitted that all those must be considered, but he agreed with Dr. Parsons that the most conspicuous point of difference between small-pox in London before and after 1885 was the removal of the small-pox hospitals out of London. From what was said in the paper he thought Dr. Sandilands might answer that the curve of London small-pox mortality before 1871, and the curve between 1871 and 1885, resembled each other in their variations and peaks, and that during and before 1871 there were no isolation hospitals in London. But the reply to that was, that between 1871 and 1885 small-pox in London behaved entirely differently from small-pox in the Provinces. If only as a filial duty, he would like to read a paragraph from Sir G. Buchanan's Annual Report to the Local Government Board of 1885 on that subject, where he referred to this difference, illustrating it by a diagram which would be familiar to many members. He said: "Some such excess had indeed been visible from earlier times," before 1871, "before London was provided with small-pox hospitals, and it was justly ascribed to a greater neglect of vaccination in London. But of recent years a new factor has plainly come into operation. Whereas in five-year periods before the great European epidemic of 1871 the small-pox death-rate of London only once reached the double of the Provinces, it has in the last two of such periods been maintained at a point sixfold and sevenfold that which has affected other parts of England; and this has been the case notwithstanding the amendments in London vaccination practice, which have had the effect of reducing, below any former experience, the small-pox mortality of children. This changed attitude of London towards the Provinces in respect of small-pox, dating from the time when London and not the country became plentifully supplied with hospitals for the disease, deserves special consideration by any whose first thought is for the aggregate Metropolis." The figures were as different as these, the death-rates being per million: in London 1875 to 1879, 292, as against the rest of England 48. In 1880 to 1884, London 244, Provinces 34. These were very substantial figures and related to large epidemics. So it was not an answer to say that the behaviour of small-pox between 1871 and 1885—during the period of hospital isolation in London—was the same as in the days before hospitals altogether; there was that very conspicuous difference as compared with the Provinces. The other point about London during that intra-urban hospital period was that during these epidemics there were certain areas, not necessarily poverty-stricken areas, but such places as Fulham, Hampstead, and Hackney, which year after year, showed an excessive incidence of small-pox over the rest of London. But every now and then they did not do so. Hampstead was up

one year, and the next year it was at the bottom of the list, and so on. The meaning was clear: it was determined by the operation of the Metropolitan Asylums Board in opening its hospitals within London for small-pox. One could almost say that during that period the Asylums Board was unconsciously placing small-pox about London as one might distribute a pack of cards. He laid stress on that because sometimes it seemed to be believed that hospital influence in London was simply a question of Fulham Hospital on one particular occasion. If anybody now had that impression he hoped they would study the 1886 Report, which Sir William Power made to the Local Government Board on the subject of the behaviour of small-pox in the different registration districts in London.¹ After 1885 the removal of the small-pox hospitals outside the London area was to a large extent the cause which broke the vicious circle and brought about the difference which was evident. And it was not solely a question of London. The literature of that time showed that London again and again was accused of starting the epidemics in the Provinces. Much was now known about the means by which epidemic small-pox was carried by vagrants and unsuspected persons belonging to the nomad class. If London, by such conditions as the hospitals, was maintaining small-pox, it was easily seen that it would spread into the Provinces, and when one of the chief causes of the maintenance of small-pox in London disappeared, a great source of infection in the Provinces disappeared also. That led him to speak of the second factor in the disappearance of small-pox, and the sudden change in its behaviour after 1885. This was a point on which he did not think the paper laid sufficient stress—namely, what had happened since the notification period in the way of tracing contacts. Since notification had been adopted there had been not notification and isolation merely, but also a systematic search for contacts, and for contacts of contacts, their detection, vaccination, and observation. If such cases were observed and they did get small-pox, they were removed quite early from the possibility of doing mischief. That new condition began after 1885. In speaking of the factors which must be considered, place should be given to that important fact.

With regard to the vaccination of the patients, the material which Dr. Sandilands had brought forward had been very difficult to handle. The author had applied, with the greatest possible patience, nearly every test he could to endeavour to get some statistics which would throw light on the protective power of primary vaccination, as tested by the last epidemic in 1902; but the methods which he had had to employ were, as he had frankly admitted, very speculative: he had had to make many allowances, and even now it was not certain that Dr. Sandilands had met all the uncertainties of the case. He would allude to one or two. Dr. Sandilands mentioned that the method he adopted consisted in attempting to estimate the relative incidence of small-pox in early adult life on the vaccinated and unvaccinated persons who were

¹ "Local Government Board—Medical Department. Extracts from the Annual Report, 1886. . . . Distribution of Small-pox in the Metropolis . . .," 1888.

present in London during the 1902 epidemic. If one was arguing on that basis, surely it was rather an assumption that both those classes were equally exposed to small-pox during 1902 all through the Metropolis. Were they? The 1902 epidemic, as Dr. Parsons had said, began with a localized and acute outbreak, and it was very patchy. Half the population of London was hardly affected in the 1902 outbreak. He thought it impossible to justify the assumption that the population of London was at all equally exposed to small-pox during that period. On p. 31, again, the six calculations which were made assumed, with one exception, that persons vaccinated in London at various ages from 1874 to 1901 all survived, and were present in London during the 1902 epidemic. Obviously they were not, and he thought that left the door open for considerable error. The other point which was mentioned by Dr. Parsons—namely, that the vaccinations allowed for should not be only those by the Public Vaccinator—was important, and he was not certain that in his calculations Dr. Sandilands had taken account of the very large amount of re-vaccination which went on during an epidemic period by private practitioners. It was very extensive, and would materially affect the question of susceptibility. He only mentioned this because it showed that any inferences—as he was sure Dr. Sandilands would admit—should be accepted in only a very tentative way. He would make no apology for referring to another Blue Book: an enormous amount of work had been done in the way of collecting exact information on the subject between 1880 and 1890, by men who were giving the best years of their life to it. Therefore he brought up Dr. Barry's report on the Sheffield outbreak of 1888.¹ If it was desired to know what was the duration of the protection afforded by primary vaccination, he did not think they need depend upon determining the vaccinal position of London in 1902, as tested by a very irregular epidemic which occurred in that year. He would rather go back to Sheffield in 1887-88, because there a vaccination census was taken for a whole town which suffered very severely from the epidemic, and where it might be assumed that almost every person was liable to exposure, or was exposed, to infection by small-pox. In that outbreak also there was a special census embracing some thousand houses, with the populations in them, with the account of the vaccinations, the scars, and all other particulars. Dr. Sandilands had brought out once or twice, from the figures which he gave, that there was no evidence of any remaining protective effect of primary vaccination when the age-period 20 to 30 was reached. But the Sheffield experience was different; it was that in each period up to and including the 20 to 30 age the evidence was on the side of the vaccination. Taking the census of the whole town, the figures were 2·8 per cent. attack-rate among vaccinated, and 10·8 per cent. among the unvaccinated. If one took the invaded houses, and the people there who were exposed to small-pox at 20 to 30 years of age, the attack-rate was 38·7 per cent. on the vaccinated, as against 79 per cent. on the unvaccinated. The Sheffield experience did not, of

¹ "Local Government Board—Report on an Epidemic of Small-pox at Sheffield, 1887-88."

course, show that the protection from small-pox, conferred by infancy vaccination, was anything like absolute up to fifteen years. That had also been the experience of many subsequent epidemics. On the question of scars, he would mention another classical document—viz., the Report to the Epidemiological Society (in the *Transactions* for 1885-86) of the Vaccination Committee, consisting of Dr. R. Cory, Dr. McCombie, and Sir Shirley Murphy. They studied the question of vaccination scars in considerable detail, and showed that certain characteristics of the scar tended to disappear with age, especially foveation, and that there appeared to be some relation between a well-foveated scar and protection. But with regard to the disappearance of scars altogether, the merging of three-scar into two-scar cases, this Committee was sceptical. And from such experience as he had had of vaccination scars he was inclined to share their opinion.

With regard to Dr. Sandilands's conclusions, in the main he had no great point of disagreement. With regard to the first conclusion, that the freedom of London from small-pox epidemics had been due only to the effects of notification and its natural sequel, isolation, on a population which included more than 75 per cent. of vaccinated persons, he thought that the effect of isolation was mainly due to its having been effected outside London, and that under "notification" must be included the control of contacts, which began at or since that date. The second conclusion of Dr. Sandilands he would qualify in the same way. The third conclusion he would be disposed to accept to the extent that small-pox of the virulence of 1871 would, in the present state of the protection of the population of London, probably be altogether in excess of anything which we should be capable of cutting short by the measures which were at present at our disposal. It was, however, largely speculative. He also thought that the author's last conclusion might be accepted in a general sense.

Dr. CAMERON desired to associate himself with those who had spoken in congratulating Dr. Sandilands on his paper. The section on vaccination was interesting to him, partly on account of the figures which the author had brought together, but mainly on account of the conclusion which he had drawn. That conclusion tallied to a considerable degree with the report which Dr. Barry made on the Sheffield epidemic and which Dr. Buchanan had quoted. The main conclusion which Dr. Sandilands had come to was that the immunity acquired from infantile vaccination continued to exert its influence up to a time of life when probably the natural immunity began to make itself felt. In discussions on small-pox and vaccination one point frequently missed was that the more important function of vaccination was not protection of the individual against attack, but his protection against death. If the person attacked by small-pox was not fatally attacked, then the disease practically came to resemble, in its relations to public health, the allied disease chicken-pox. It was the fact that a person might die from small-pox which gave that disease its importance. That was often lost sight

of, and there were some in the medical profession, even among those who had to do with public health, who argued that compulsory infantile vaccination was a disadvantage rather than an advantage, because the individual attacked, being partially protected against the disease by vaccination, developed a modified attack and so became a source of infection to others, forgetting that the latter, if not protected by vaccination, were liable not merely to attack but perhaps to death. The criticism which Dr. Parsons passed on Table II he agreed with. In his previous tables the author had put himself to considerable trouble to avoid pitfalls in dealing with selected populations, but in Table II he introduced an additional factor, the factor of the scar, and in no way could he bring any evidence to show that he had calculated the number of persons who were probably exposed to infection and who possessed four scars. There was some disappointment left after hearing the paper. The title was slightly misleading. The mantle of the prophet was not so apparent as the title of the paper led one to expect. He thought that the same criticism might be applied to the remarks of the two previous speakers, who also seemed to avoid any speculation as to the course small-pox in London might be expected to take in the near future. He thought Dr. Sandilands might have found some data since 1884-85 which might justify him in coming nearer to playing the prophetic rôle than he did. Since 1884-85 (whether it was due to hospital isolation or to such isolation outside London was a matter of opinion) there was no doubt that small-pox in London began to exhibit a peculiar London cycle. The experience from 1884 to 1893 was almost exactly repeated from 1893 to 1902. That this London cycle was not altogether an accident he thought was evident from this recurrence and from the fact that the Medical Superintendent of the Small-pox Hospital, Dr. Ricketts, in his Annual Report to the Board for 1898, written at a time when the hospital was empty, warned the Managers that probably in three years' time they would have to deal with a considerable outbreak of the disease. In 1901 that outbreak did occur, and the fulfilment of the forecast showed that the cycle was really a new factor which had entered on the scene. Dr. Sandilands had neglected that minor cycle. It seemed that the cycle with which he had dealt was the pandemic cycle of small-pox. The 1871 outbreak, which was ascribed to the Franco-Prussian War, and the 1902 outbreak, when the infection was brought from Paris, were not peculiar to London nor to this country. During the period 1900-03 small-pox was really pandemic; it appeared to excess in practically every part of the world, and he believed that the same occurred in 1871. It had been pointed out that the climax of the London cycle coincided with the climax of the pandemic cycle in the 1900-03 period, a fact which was held to account for the comparatively high figures of the 1902 London outbreak. The important practical point about this minor cycle was not associated with the length of its period but rather with the observation of its phases. The characteristics of the advancing phase of the cycle were, he thought, the most important. Sir Arthur Whitelegge had pointed out, in reference to the 1871 outbreak, that in the rising phase

of the small-pox wave the disease acquired an increased capacity to spread, and that increase in case-severity and mortality was a feature of the advancing epidemic. He thought that the outbreak in 1901 showed these conditions well, because during the first four months of the epidemic beginning with the end of July, 1901, almost every borough in London had been attacked by the disease and the case-mortality of 1901 was high. He remembered that cases of the most virulent form of the disease almost ceased to appear after the end of the year. Let these conditions be applied to the present cycle. The decline was apparent from 1902 to 1907, and he thought that there was evidence that the disease in London had again entered on its rising phase, for the reason that during the last spring the explosive outbreak in the East End of London was characterized by a considerable case-severity and a death-rate of 15·7 per cent. Although the praiseworthy energy and care with which the Sanitary Authorities dealt with the outbreak were rewarded by success, he thought that fortune had favoured them to a certain extent, from the fact that the originating case was confined to the ward of an infirmary during the greater part of its infecting period. If that case had occurred, as such cases were known to occur, in a common lodging-house or among people who were essentially nomadic, he doubted whether the outbreak in the East End of London would have been so readily stamped out. The point he wished to emphasize was that during the rising phase of the cycle, the missed case to which Dr. Sandilands had referred acquired an importance far beyond its importance during the phase of decline. As bearing on the future of small-pox in London he would only refer to the increase in the number of unprotected children. That condition would not show its effect until some years had elapsed. Another point which he thought was worth mentioning in connexion with the difficulties with which sanitary authorities had to contend in trying to control the disease in the Metropolis, was the extraordinary increase in the means of communication all over London and Greater London during recent years. The tramway system, the motor omnibus, and the great extension of the underground electric railways had all developed since 1902. Might this condition not be regarded as an additional handicap to any sanitary authority in dealing with an outbreak of small-pox, if cases happened to be missed? He thought that on the other side of the balance there was entitled to be placed the recent Order of the Local Government Board which brought all the casual wards of the Metropolis under one authority. It was the casual ward as well as the common lodging-house where small-pox was likely to obtain the surest hold, and whence it was more likely to pass beyond the control of the London Authorities than from any other centre.

Dr. REECE said there was one point which Dr. Sandilands might take note of in regard to small-pox, not only in London but all over England—namely, the altered conditions of vaccination. In 1840 the first Vaccination Act was passed; it provided means of vaccination, at the public cost, for every person

52 Sandilands: *Small-pox in London, 1885 to 1935*

in England and Wales, but left it entirely optional whether he should avail himself of its advantages. In 1853 vaccination was made compulsory, but the Act was indifferently enforced. In 1861 Boards of Guardians were authorized to appoint vaccination officers to enforce the law, and the appointment of these officers became compulsory by the 1871 Act. All that time we were in the main depending on arm-to-arm vaccination, and from the children vaccinated only a small amount of lymph could be obtained for the vaccination of other children; lymph could never be procured in bulk. In recent years the production of lymph had been put upon a different footing. It was now possible at short notice to procure in a few hours not only a thousand tubes of glycerinated calf-lymph, but several thousand tubes. The epidemic of 1902 was dealt with by means of glycerinated calf-lymph, and he believed there was no shortage of it. The Government supplied large quantities, there were private factories for it in England, and lymph was imported from the Continent. The number of re-vaccinations, apart from primary vaccination of infants, performed in 1901-02 must have been enormous. The following table shows the number of tubes of glycerinated calf-lymph issued by the Government and used for primary vaccinations and for re-vaccinations in public vaccination only during this period:—

Year	Quarter ending	Primary vaccinations	Re-vaccinations	Total
1901	June	113,324	2,402	—
"	September	113,732	16,626	—
"	December	128,737	141,022	—
1902	March	154,868	273,728	—
		510,661	433,178	943,839
"	June	130,261	67,214	—
"	September	135,143	21,583	—
"	December	115,601	27,538	—
1903	March	146,340	111,813	—
		527,345	228,148	755,493

Under present-day conditions a thousand tubes of lymph could be sent to any part of the country on receipt of a telegram. The Government had in cold storage upwards of half a million tubes of glycerinated calf-lymph available for immediate use. Properly kept, in cold storage, lymph preserved its potency for a long time. This reserve supply was quite distinct from the hundred thousand tubes kept for current supply. An essential factor of the more effectual control of recent small-pox outbreaks, as evidenced by the fewer number of attacks and deaths when compared with former epidemics, was that lymph could be obtained without having to wait for it, and that it could be supplied in abundance. This matter would have to be considered in future discussions of small-pox epidemics.

With regard to isolation, all who had seen much of small-pox in epidemic

form would agree that once an epidemic had started, the isolation in hospital of all, or nearly all, the patients would not stop the spread of the disease unless the contacts were traced and successfully vaccinated. The author had said that notification was one of the factors which had brought about the fall in small-pox from 1885 onwards. The Infectious Diseases Notification Act did not pass until 1889, and did not come into operation until November of that year, so that there was no compulsory notification during the first five years of the period under review.

Fleet-Surgeon HOME desired to join with others in thanking Dr. Sandilands for his very careful paper. He had once himself seen the disappearance of small-pox under conditions where there was no question of change in isolation or notification, in the squadron in China in 1897-99. There were, in 1897, twenty-five cases of small-pox in the squadron, and sharp things were said to them for having it. The Commodore got fresh lymph from Saigon, instead of that which came overland by Canada from England, and, moreover, got it used; consequently small-pox decreased, and in 1900, when thousands of seamen were landed in North China, there were only two cases in the Fleet, fewer than ever before. The difference there was not improved notification and isolation, but simply and purely better vaccination. About the varying virulence of epidemics, it was difficult to decide whether an infection was virulent or not. Dr. Parsons had given a most interesting account of the different virulence in 1902 of the small-pox imported from Paris and that from America. That was actual observation; one could not appreciate such a point from the examination of the mere statistics for past years. The author believed a guide for judging the virulence of an epidemic could be got from the mortality, but that varied with the state as to vaccination of the patients. One got a very good idea of the way in which vaccination protected against small-pox from Dr. Ricketts's splendid work on "The Diagnosis of Small-pox." One should imagine vaccination as the warder of a castle threatened by the forces of small-pox. The warder when he was young was very strenuous, and kept the enemy well at a distance—they were so afraid of him. As he became older they came closer, and by and by he slept, and did not rouse up till the din of battle woke him, and as he aged that din had to become louder and go on longer before he stirred and exerted his strength. And so one might say that for fifteen years after vaccination a man was completely protected against small-pox; for another period, say ten years, only the initial fever would develop (*variola sine eruptione*) and the disease would then be stopped before the rash, or as protection failed through lapse of time, the rash might indeed appear, but the secondary fever be prevented. Or the case might go on to be confluent, and when everything looked dark and prognosis was grave, even at that stage the slumbering protection of an old vaccination might be awaked, the diseased process might then abort, and the patient recover. So it was difficult to get an exact idea as to the virulence of a particular small-pox epidemic from mere statistics of mortality, one must also know something of the condition as regards vaccination of the patients who had been in hospital.

Dr. DUDFIELD said that after what Dr. Buchanan had said about the treatment of cases of small-pox outside the Metropolitan area, he (Dr. Dudfield) thought he might allude to the history of the practice. "Darenth Camp" was opened for the reception of convalescent patients and "mild" cases on May 11, 1881, barely three weeks after a deputation to the Local Government Board on the question of hospital accommodation for the disease. That question had entered on an acute phase owing to the injunction obtained just previously against the Metropolitan Asylums Board, by which the Board were prevented from using the accommodation provided within the Metropolitan area. In addressing the President of the Local Government Board at the request of the members of the deputation, the late Dr. Dudfield put forward a suggestion to use the land at Darenth for the purpose of accommodating small-pox patients, a suggestion which he had placed before the Asylums Board on a previous occasion. The suggestion met with general approval, and the first camp was opened within three weeks. The credit of the change in hospital provision for small-pox, to which was attributed the immunity from that disease which had been enjoyed by the Metropolis for many years, might, the speaker thought, be given to the late Dr. Dudfield. For a time small-pox patients were treated in certain hospitals within the Metropolis, as well as at Long Reach and Darenth. In 1885 all such patients were removed beyond the Metropolitan area for treatment. The principal reason for that change in practice was the theory that small-pox hospitals acted as centres of infection for the districts in which they were situated, the disease being alleged to be transmitted from the hospitals by aerial convection. Personally he was very sceptical about such a theory, which appeared to him to be unnecessary to explain the increased prevalence of the disease in areas around hospitals. He thought such prevalence could be explained by the ordinary channels of infection—viz., persons passing to and from the hospitals. The experience following the treatment of the disease in ordinary hospitals in Germany, as recorded by Dr. Bruce Low, discounted, in the speaker's opinion, any theory of aerial convection. It was a question of the amount of vaccinal protection prevailing in the district which decided whether the disease was to be limited to the hospital or spread in the vicinity thereof. However, he felt that he was in a minority, almost of one, on that question, to which his attention had been attracted even before he began the study of medicine.

Turning to the paper, he desired to call attention to Table XI. Dr. Sandilands had suggested that the changes in the relative proportions of four, three, &c., scars, recorded at ages ranging from 20 to 40 years, had been due to disappearance of scars with advancing age of the patients. It was, however, worth noting that the patients entered in that table as 30 years of age would be persons who were among the earliest to be vaccinated after the passing of the Vaccination Act of 1871. Although the Local Government Board's Order prescribing the number of places for vaccination was not issued until some years later, he thought it might be assumed that the increased proportions of patients with more scars might be attributed to the operation of that Act. He felt

considerable difficulty in believing that good scars completely disappeared with age, certainly at such comparatively early ages as suggested by the author.

Much labour had been devoted by the author to the calculation of the probable proportion of the population protected by vaccination. As had already been mentioned, the methods adopted suffered from an inherent defect—viz., an assumption, implied in the methods, that the whole population had been equally exposed to infection. Such was far from the truth. He thought Dr. Sandilands would have obtained a better "sample" by collating the statistics of vaccination and attack among the "contacts," records of which must be in the possession of the medical officers of health.

On the question of the measure of protection against small-pox which was afforded by vaccination, he desired to call attention to the correlation coefficients given in a paper in the first volume of *Biometrika*,¹ a journal not usually read by medical men. The co-efficients (*r.*) varied between 0.5 and 0.7, showing a high degree of correlation, and demonstrating excellent protection against attack. There were other papers on the same subject in the later volumes of that journal, but he had not found any determinations of the co-efficients at different ages of life. He thought that the "run" of such co-efficients would throw light on the question of exhaustion of protection adverted to by the author.

One last point. The author had expressed doubts as to the influence of natural selection in the eradication of disease, and had specially referred to consumption. He (the speaker) would like to call attention to Professor Karl Pearson's latest pamphlet on the question.² It appeared to him that it was incontestably shown in that work that natural selection had played, and was playing, a part in the reduction in the mortality from pulmonary tuberculosis.

Dr. SANDILANDS, in reply, said that both Dr. Parsons and Dr. Buchanan had found fault with him because he had not mentioned the fact that isolation hospitals for small-pox were removed from London in 1885. What he said was, "It is impossible not to be struck with the fact that it is since the year 1885 that the Metropolis had presented so satisfactory an aspect as regards small-pox mortality. The facts certainly seem to point to the conclusion that this has been due to a system of isolation, well organized and administered." He thought the only difference was as to the meaning of the words "well-organized isolation." Clearly isolation beyond London was better than isolation within London. The removal of hospitals from London was fully dealt with in the Report of the Royal Commission, and had been a very important factor. Dr. Parsons attributed to the presence of small-pox hospitals in London the

¹ Macdonell, W. R., "On the Influence of previous Vaccination in Cases of Small-pox," *Biometrika*, Camb., 1901-02, i, pp. 375-83.

² "The Fight against Tuberculosis, and the Death-rate from Phthisis," 1911.

increased virulence of the virus of small-pox. So far as history went, they appeared to have had the opposite effect, because up to 1870 there were no hospitals at all for small-pox, with the exception of 100 beds in the hospital at Highgate. From 1870 to 1885 patients were isolated in hospitals within London, and the mortality fell steadily from 1871 onwards. With regard to Dr. Parsons's question as to the age of the children to which the Local Government Board returns related, from Dr. Newsholme's last report it appeared that the age of the children varied from 13 to 25 months. Those were the extreme ages which could be included in the returns sent in in February. He was uncertain whether the Public Vaccinator, in returning the primary vaccinations after one year of age, included the subjects of statutory vaccination, or not. [Dr. PARSONS: All the vaccinations performed at the public cost were included in the returns sent in by the clerks in September.] They were divided into persons under 1 year and persons over 1 year. He was not certain whether the figures for persons over 1 year repeated figures which had already been given in the other return for statutory vaccination in infancy. [Dr. PARSONS: They include them.] In that case the number of primary vaccinations he had taken would be excessive, because they would include some people who would be in the returns of statutory vaccinations in relation to births. Dr. Parsons gave it as his opinion—referring to a subject on which he was well qualified to speak—that the number of vaccinated persons as given in the paper had been under-estimated. With that opinion he agreed. And if it were so, it would follow that the duration of the protective effect of vaccination was even longer than had been claimed that evening. He had purposely avoided any assumption which would tend to exaggerate the case in favour of prolonged protection from vaccination. Dr. Parsons had said he could not imagine that one scar would disappear at a time; but from a large experience of measuring these vaccination scars in small-pox patients, he could say it was very common to see vaccination scars of most unequal type—one or two would be large bold scars which would not fade, but the third and fourth scars might be difficult to detect. And in the case of old people with a shrivelled and shiny skin it was common to find no more than one scar. So he had no doubt that in the later years of life the scars disappeared with the exception of the very deep ones.

Dr. Buchanan made a pertinent suggestion, which was contained in the Report of the Royal Commission, that the particular populations affected by these outbreaks might not possess the same proportion of vaccinated persons as did the population of London as a whole. He did not deal with that point in his paper, because he was unwilling to detain the Section. But if one assumed the percentage of vaccinated persons at each age-period in the affected to be as low as 80 per cent., one was placed in the difficulty that in the later age-periods, 20 to 25 and 25 to 30, the cases occurring in the 1902 epidemic would show a higher incidence on the vaccinated than on the unvaccinated. Unless one assumed some such percentages as he had given—viz., 90 per cent. to 92 per cent. of vaccinated persons in the population—this anomaly

was bound to result; and it was difficult to believe that at any age-period it was likely that the incidence of small-pox on the vaccinated could be higher than it was on the unvaccinated. Dr. Buchanan quoted Dr. Barry's Sheffield figures, and he (Dr. Sandilands) owed the Section an apology for having overlooked them. His reason had been that in the Final Report the Commissioners were exceedingly diffident about making any statement as to the duration of the protective effect of vaccination beyond 10 years of age. They quoted Dr. Barry's report, but only gave the figures for those under and over 10 years of age. Persons over the age of 10 were treated as one group, and he could not suppose, in reading the Final Report, that if the figures after the age of 20 had been so striking the Commissioners would have avoided all reference to them. Dr. Buchanan had given a warning against confusion between the average duration of the protective effect of vaccination and the duration of protection in individuals. It had been his (the speaker's) misfortune to have seen a considerable number of children of 4 or 5 years of age with four good vaccination marks sitting up in bed with a plentiful rash of discrete small-pox. The youngest vaccinated child ever admitted with small-pox to the Metropolitan Asylums Board Hospitals was a baby between 1 and 2 years of age with two distinct vaccination scars and a discrete rash. So there was no connexion between the average duration of protection and the protective effect in the individual, which might break down in two or three years.

Dr. Cameron submitted that the patients in small-pox hospitals afforded no indication as to the constitution of the general population, in regard to the number of scars they showed. He (Dr. Sandilands) would have thought that if one assumed an equal age-incidence on the scar-bearing population—and there was no particular reason why the age-incidence should not be the same—the distribution of scars in a small-pox hospital amongst the patients would be the same as the distribution in the population, unless there was this fading of scars taking place. Even if the one-scar population were more liable to small-pox, he did not see why the fact that they were more liable should upset the age-distribution. He was aware that Dr. Ricketts, under whom he had the honour of working, prophesied that there would be a London epidemic in 1901, and it came about. Dr. Cameron made the criticism that Dr. Ricketts was able to prophesy from his knowledge of the pandemics which occurred in the past, and said his (Dr. Sandilands's) prophesy referred to pandemics, and not to minor epidemics. This he was quite prepared to admit, and the point of his paper was that our present organization was sufficient for the prevention of the spread of minor epidemics, but that when a pandemic period arose through an enhanced virulence of the infecting agent, this organization would break down. Dr. Reece regretted that more had not been said about the protective effect of vaccination in times of epidemics, and said that the man who would put an end to epidemics when they occurred would be the man who vaccinated contacts. In answer to that, he had only to say that such a man was conspicuous by his absence in the case of the 1902 epidemic, because,

as he had pointed out, in the single month of March, seven months after the epidemic had begun, 1,900 cases occurred, and the number notified in those four weeks exceeded those notified in the last quarter of 1901. So that the efforts of those gentlemen who vaccinated contacts did not succeed in preventing the epidemic from continuing until the date when it was due to subside. The number of vaccinations during the epidemic was, as a matter of fact, enormous: there were 60,000 primary vaccinations after the age of infancy performed in the year 1902, and the number of re-vaccinations was 315,000. Dr. Dudfield said it was not until some years after 1885 that all small-pox cases were removed from London. As a matter of fact, the ships were available in 1886, and, as stated in his paper, after the year 1885 every case occurring in London was removed. Whether the ships could have provided for a large epidemic in 1886 he did not know, but no epidemic took place.

Epidemiological Section.

January 26, 1912.

Dr. ARTHUR NEWSHOLME, C.B., Vice-President of the Section,
in the Chair.

Certain Ætiological Considerations arising from Observations of the Behaviour of Poliomyelitis in Devon and Cornwall, 1911.

By R. J. REECE, M.D.

(I) PREVALENCE OF POLIOMYELITIS IN DEVON AND CORNWALL AND IN OTHER PARTS OF ENGLAND IN 1911.

AN inquiry respecting poliomyelitis occurring in the summer of 1911 in one small town and in its immediate neighbourhood led to the investigation of wider prevalence of the malady in two counties during the year. The circumstances of 154 cases ascertained to have occurred prior to September 16 form the subject of a report to the Local Government Board. By December 16, the total number of known cases had increased to 224 inclusive of a few which, having been attacked prior to September 16, had only come to knowledge at a subsequent date. These 224 cases occurred in twenty-three urban and twenty-six rural districts.

The distribution of these cases is shown on the accompanying map, which illustrates not only the actual numerical extent of the prevalence, but also the wide dispersion of the ascertained cases in the two counties. These facts respecting Devon and Cornwall were of a nature to raise suspicion that in other county areas of this country a like prevalence of poliomyelitis might have been discovered had means been taken to that end; and a suspicion of this kind appears to have been justified in the records of other recent prevalence of the malady which have since come to hand.

Dr. Soltan has written an account of seventy-three cases which occurred in Plymouth, Stonehouse and Devonport last summer. It is known that some forty cases occurred in Westmorland, that there have been small outbreaks at Ilkley, in Yorkshire, around Stowmarket and in the Thingoe Rural and Woodbridge Urban Districts in Suffolk; in the neighbourhood of Ely; in the Martley Rural District; in the Lodden and Clavering Rural and Downham Rural Districts in Norfolk; in the Christchurch Rural and Lymington Rural and Urban and Alresford Districts in Hampshire; in the Fylde Rural District in Lancashire; in the Swadlincote Urban District in South Derbyshire; in Huntingdonshire; in the Kesteven Division of Lincolnshire and in Worcestershire.

Compulsory notification has been in operation in the London County Council area, and since the week ending September 9, to the end of the year, some sixty-nine cases have been notified.

(II) INCIDENCE OF THE DISEASE.

In the course of the inquiry in Devon and Cornwall the cases at first looked for were definite cases of affection of the spinal cord marked by paralysis or other symptoms definitely referable to myelitis. The majority of the cases were severe. Of the 154 cases dealt with in my report to the Local Government Board, thirty-four died; a case fatality of 22.1 per cent.

Wickman describes eight classical types of the disease: The spinal poliomyelitic type, the ascending or descending types, the bulbar or pontine form, the encephalic form, the ataxic form, the polyneuritic type, the meningeal type, and abortive forms. With the exception of the ataxic type, each of these forms was encountered among the 154 cases.

In the literature of the subject the determining causes of poliomyelitis have been regarded as various. It has been noted that the patient, or the friends of the patient, have attributed the onset of the disease to wading in water, or to swimming, to an accidental fall, to a chill, to teething trouble, or even to some unusual exertion such as working in the harvest field.

In Devon and Cornwall there were onsets the determining cause of which was similarly open to surmise. There were children who went to bed apparently quite well and were found paralysed, usually in the lower extremities, in the morning. There were children who having attended school were unable to walk home through loss of power in

their limbs. In one case a patient on being suddenly attacked rapidly lost power in his legs and was unable to walk upstairs. With regard to a certain number of patients, there were prodromal symptoms which took the form of listlessness or drowsiness; the children were said to "lie about and sleep" for a day or more before the acute onset. Pain—sometimes very acute—in head, or neck, or spine, or in a group of muscles, or in a limb was not uncommon.

In my report to the Local Government Board the clinical features are dealt with in detail and several illustrative cases are fully described. I shall refer to abortive cases later.

In Devon and Cornwall cases of possible poliomyelitis were of course looked for in adults as well as in children, and my report shows that although a larger number of children than of adults were attacked, the latter furnish a proportion of the cases.

Of 218 cases of which I have the actual ages, the age and sex-distribution were as follows:—

Age in years	NUMBER OF CASES			Total		Percentage of cases in age-groups
	Males	Females				
Under 1	7	4	11			
" 2	19	8	27			
" 3	18	10	28	102	...	46.8
" 4	12	10	22			
" 5	7	7	14			
" 6	12	7	19			
" 7	7	10	17			
" 8	9	7	16	70	...	32.1
" 9	8	5	13			
" 10	4	1	5			
" 11	2	3	5			
" 12	1	1	2			
" 13	4	1	5	21	...	9.6
" 14	3	4	7			
" 15	1	1	2			
" 16	1	—	1			
" 17	1	1	2			
" 18	1	—	1	5	...	2.3
" 19	—	—	—			
" 20	—	1	1			
" 21	—	1	1			
" 24	1	—	1	5	...	2.3
" 25	3	—	3			
" 26	2	—	2			
" 27	1	—	1			
" 29	—	2	2	6	...	2.8
" 30	1	—	1			
" 31	1	1	2			
" 34	1	—	1			
" 36	—	1	1			
" 37	1	1	2	9	...	4.1
" 38	1	—	1			
" 43	1	—	1			
" 46	1	—	1			
	131	87	218			100.0

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The age and sex-distribution of the 42 deaths which occurred in these 218 cases are as follows:—

Age in years	NUMBER OF CASES			Total
	Males	Females		
1	2	2	4	14
2	3	1	4	
3	2	1	3	
4	2	1	3	
5	—	—	—	14
6	2	1	3	
7	4	3	7	
8	1	—	1	
9	3	—	3	6
10	1	—	1	
11	—	1	1	
12	1	—	1	
13	3	—	3	2
14	—	—	—	
15	1	—	1	
21	—	1	1	
26	1	—	1	2
29	1	—	1	
31	1	1	2	
37	1	—	1	
46	1	—	1	
	30	12	42	

The case fatality, 19·2 per cent., is high; and the suggestion arises whether cases of the abortive type occurred which were not discovered or not recognized as cases of poliomyelitis.

Of the cases concerning which I have detailed information, 158 cases occurred in 132 houses. From these cases the following figures are taken:—

Number of invaded households	Number of persons living per invaded house	Number of persons living in these invaded houses	Number of multiple attacks in these houses
14	3	42	—
20	4	80	2 cases in 1 house
29	5	145	4 " "
21	6	126	2 " "
24	7	168	4 cases in 1 house
10	8	80	3 cases each in 2 houses
4	9	36	2 " " "
4	10	40	2 cases in 1 house
2	11	22	—
3	12	36	4 cases in 1 house
1	13	13	6 " "
			4 " "
132		788	

The percentage of attack in the population of the invaded houses is therefore 20 per cent.

It has only been possible to get the exact ages of each of the inmates of the invaded houses in 113 instances, and for this number of households, the following information has been obtained:—

Ages	Number of persons at that age	Number of persons at that age who suffered attack	Percentage attacked
Under 1	30	10	33·3
" 2	25	15	60·0
" 3	38	16	42·1
" 4	34	15	44·1
" 5	24	9	37·5
" 6	36	10	27·8
" 7	24	10	41·7
" 8	27	8	29·6
" 9	19	9	47·4
" 10	17	5	29·4
" 11	10	4	40·0
" 12	18	2	11·1
" 13	16	5	31·2
" 14	10	3	30·0
" 15	15	1	6·7
15-20	35	1	2·9
20-25	49	4	8·2
25-30	53	1	1·9
30-50	162	5	3·1
50 and over	32	0	0·0
	674	133	19·7

There were no recorded attacks at ages over 50 years. Of the total number of persons at all ages, 674, dwelling in these 113 houses, 133 persons, or 19·7 per cent., were attacked.

The figures are few, and it would be unsafe to draw any but the broadest inferences from them. But so far as they go, they tend to show that liability to attack steadily decreases with advancing age.

The question naturally arises, were all these in Devon and Cornwall cases of poliomyelitis? I am of the opinion that the answer should be in the affirmative. I do not think that there were among them any cases of cerebrospinal fever; although some cases presented meningeal symptoms. In a certain number of instances lumbar puncture was performed, and the spinal fluid forwarded to Dr. Mervyn Gordon for examination. In no single specimen was the *Diplococcus intracellularis* discovered. In one case, where meningeal symptoms were very marked, examination of the patient's spinal cord after death showed the characteristic histological signs of acute poliomyelitis; and from portions of this cord Levaditi produced experimental poliomyelitis in the monkey.

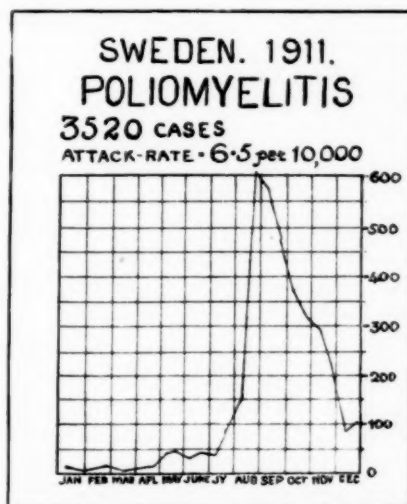
My experience would lead me to doubt whether there occur mixed epidemics of acute poliomyelitis and cerebrospinal fever, as has been suggested. On several occasions this last summer I have been in communication with medical men in different parts of the country who suspected that they were confronted with a case or cases of cerebrospinal fever. In each such instance, where lumbar puncture has been performed, the *Diplococcus intracellularis* has not been found, and when opportunity has been afforded to examine a portion of the cord of any such case after death the typical lesions of acute poliomyelitis have been present.

(III) AS TO CONDITIONS, APART FROM CASE TO CASE INFECTION, FAVOURING PREVALENCE OF THE DISEASE, OR ENHANCING THE ACTIVITY OF ITS VIRUS.

Throughout the foreign literature poliomyelitis is recognized as a warm weather disease in temperate climates. It will be admitted that the summer of 1911 was an unusual one for England. The diagram I show reproduces certain phases of weather condition in the south-western part of England from April to September 16. The diagram was prepared by Dr. W. N. Shaw, F.R.S., Director of H.M. Meteorological Office. Owing to the configuration of the counties of Devon and Cornwall, the climatic conditions vary within somewhat wide limits at one and the same time in different parts of the counties. The meteorological data exhibited in the diagram are equated for the south-western division of England. The facts recorded must be regarded as showing, in general fashion only, the climatic conditions which obtained. The diagram also exhibits numerically week by week the ascertained attacks from poliomyelitis, from the period in May when the first cases came under notice until the week ending September 16. It will be seen that the greatest number of known cases in any one week in the period under review occurred in mid-August. Speaking generally, it can be said that the curve of known cases was rising while the temperatures of air, earth and water were also on the rise, and that the decline in poliomyelitis coincided with, or closely followed, the declensions of the earth and sea temperatures at the places given. The diagrams also show that during the present year the temperature curves are all higher than the mean of past years. In the Northern Hemisphere poliomyelitis has shown its great prevalence in the warm season of the year, and this distribu-

tion of season prevalence was observed in the outbreak under consideration. In Devon and Cornwall the disease had practically died out by the end of the year.

Somewhat similar seasonal distribution of the disease is shown in Sweden, where over 3,000 known cases occurred during the year 1911; the first known case occurred in Stockholm in January, and in the same month there was a case in the Northern Province of Vesterbotten. It then appeared in Central Sweden, and isolated cases appeared successively in almost every province. It is thought by local investigators that the disease as a rule followed the railway lines.



In April the number of cases noted was ten, all in country districts; in the first half of May it was thirty-five. The first considerable rise in numbers occurred in the last half of July, when it rose to ninety-nine. The numbers for the succeeding half-months to the end of October were as follow: 150, 608, 573, 485, 375, and 327. It will thus be seen that in Sweden the malady was at its highest prevalence at the end of August. It did not, however, disappear with the onset of the cold weather. It still maintained its prevalence, but in reduced extent, to the end of November. At that time it was prevalent in considerable amount in the Northern Province of Vesterbotten, notwithstanding the fact that the country had been frozen for some time.

I pass now to review of agencies possibly concerned in dissemination of the poliomyelitis:—

Dust as a factor in the possible spread of the disease was considered by me, with the result that I was unable to draw any definite conclusion. Surmise that dust plays a part in the occurrence of epidemic poliomyelitis is based to a certain extent on the prevalence of the disease in hot, dry seasons. The fact, however, that poliomyelitis appeared in the extreme northern province of Sweden, which had hitherto been exempt from the disease, in November of last year, at a time, too, when the severe cold of the winter had already set in, suffices to show that considerable prevalence of the disease may occur altogether independently of out-door dust.

As regards Dust within doors.—Towards the end of the year 1911 Dr. Neustaedter and Dr. Theo, of New York, claimed to have produced experimental poliomyelitis in monkeys by intraspinal injection of a filtrate of dust obtained from a room in which a case of poliomyelitis occurred. As it has been shown that the pharyngeal mucous membrane may contain the virus of poliomyelitis, and that the virus resists desiccation, it is not unreasonable to suppose that exceptionally the dust of a room in which a case of poliomyelitis has been treated may contain the virus. This is, however, far from proving that the dust of roads and railways is the vehicle by which the infection of epidemic poliomyelitis is conveyed.

Flies.—Flexner and Clarke have shown that house-flies purposely contaminated with the virus of poliomyelitis harbour the virus in a living and infectious state for at least forty-eight hours. There was evidence in Devon and Cornwall that flies were unusually numerous in these counties during this last summer. And outside England cases of poliomyelitis occurred in the extreme north of Sweden at a time when there were no flies owing to sustained frost. The inference seems to be that poliomyelitis can occur altogether independently of flies.

Biting Insects.—Apart from any question of these insects as carriers, no evidence of their having played a part in the prevalence of the disease was obtained.

Clothes.—There is a regular trade in second-hand clothes in Holsworthy, in Devon, which are sent there for sale from Houndsditch, in London, and special inquiry concerning this trade was accordingly made. No fact was elicited tending to show that any of these clothes had been purchased by members of the invaded households, with one exception. In this instance the child who wore the second-hand clothes was not attacked by the disease until three days

after her younger brother became ill. Further, the cases in this household did not occur until July, and there had been earlier cases in the district.

Disease of Animals.—Inquiry showed that two pigs belonging to the family of the first known case in Devonshire had died quite suddenly four days after the death by poliomyelitis of the child. The deaths of these animals could not be attributed to any definite cause. There had been no swine fever in the district for over two years. It is of interest to note that the earliest case of those I have records of in Cornwall was also associated with the death of an animal. A week before the child was taken ill a horse belonging to the father of the patient suffered from what is locally termed "poke neck." It is said to have been paralysed in the neck and forequarters. It fell down in the stable and was unable to rise; it was conveyed to a field, where it again fell down. It was shot without having been seen by a veterinary surgeon. In my report to the Local Government Board I note facts as to deaths of fowls, of a bull and of a calf in circumstances seemingly connecting such deaths indirectly with occurrences of cases of poliomyelitis in the human subject. But this seeming association of disease in animals and in man may very possibly be nothing more than coincidence. In this country the veterinary profession has not adduced any evidence that the lower animals are liable to attack by epidemic disease which produces symptoms allied to poliomyelitis, or, indeed, that poliomyelitis occurs at all in the lower animals. In the literature of other countries it has been stated in connexion with a number of epidemics of poliomyelitis that domestic animals, including chickens, dogs, horses, pigs, cattle and sheep, were found in the same district to be suffering from paralytic diseases, clinically similar to the disease prevailing among human beings. Dana, of New York, in 1895, stated that the lumbar cord of a chicken examined by him showed lesions resembling those of poliomyelitis. But, generally, detailed inquiry into the pathological condition of the spinal cords of the animals affected is lacking. The possible association of the disease in man and lower animals is not, however, one that can be lightly passed by, for even if man and the lower animals do not in fact mutually infect one another, there still remains the possibility of both being infected from a common source. It is, however, reported that during the last year some 800 reindeer, mostly calves, have been found dead from poliomyelitis in the neighbourhood of Kautokeino, in Norway. From Sweden we learn that reindeer, poultry, lemming, and dogs suffered this last year from

a similar complaint. The matter is under investigation by the respective Governments of these countries, and at present we do not know whether the statement that the reindeer have died from poliomyelitis is founded on a definite scientific basis or on surmise.

(IV) CASE TO CASE INFECTION.

(A) *Multiple Cases in Dwellings.*

I have been unable to obtain the necessary information to compile a table of multiple attacks in houses for the whole of the 224 cases which occurred in Devon and Cornwall up to December 16, 1911; but the first recorded 154 cases occurred in 129 houses and furnish the following table:—

Number of cases in each house	1	...	2	...	3	...	4	...	5	...	6		
Number of houses	118	...	4	...	2	...	4	...	0	...	1

These figures do not include data respecting an outbreak which occurred at Stoke Rivers in the Barnstaple Rural District, Devon; none of the cases in that outbreak are included in the 154 cases tabulated above. The Stoke Rivers outbreak was exceptional in that multiple cases occurred in most of the houses. Instances of occurrence in sequence of multiple cases in particular houses suggests (though of course it does not prove) that person to person infection may have been operative sometimes with much intensity; and in this connexion the Stoke Rivers outbreak deserves especial notice. This small community occupying eighteen houses furnish the following figures:—

Number of cases in each house	0	...	1	...	2	...	3	...	9		
Number of houses	4	...	3	...	6	...	4	...	1

As regards not a few invaded families of the 154 cases it was ascertained that first cases had been associated with persons previously attacked, children had played together, visited one another's houses, or lived in adjoining houses. On the other hand, under circumstances apparently comparable, where children had been closely associated with others who became sick, even sleeping in the same bed with them up to the date of attack, there was no spread of infection. Although in some seventeen instances the only child of the family was attacked, there were a large number of instances where only one person was attacked in a house containing children as well as adults.

(B) Multiple Cases in Towns and Villages.

When poliomyelitis was introduced into the small towns, as for instance at Holsworthy and Bude, where some of the earliest cases occurred, the subsequent cases were few. In like manner, when introduced into larger urban communities where the population is aggregated, as at New Quay, Barnstaple and Falmouth, spread of the infection did not readily occur. On the other hand, the disease seemed to show a preference almost for development in isolated places; many remote farmhouses and cottages being invaded.

Groups of cases occurred in sparsely populated rural areas which invited special consideration. For instance, a case occurred in a cottage in the last week of July, which was followed on August 4 by that of a child attacked in a farmhouse about a mile and a half distant from the cottage, and by two other cases in the same farmhouse on August 5 and August 10, the last proving fatal. On August 9 a case occurred in another and neighbouring farmhouse. Between August 14 and 18 six cases of mild type occurred in a cottage situated close to the gates of the first farm, and on August 21 a case occurred in another cottage close by this farm. Personal infection from case to case in this group could not, as regards first cases in these houses, be excluded; but the exceptionally heavy incidence on the last four invaded dwellings was certainly highly suggestive of transmission of infection in this way.

(C) Mild or Abortive Cases.

Existence of such cases was established during the inquiry. Only a small number of the 154 cases were known as "abortive" cases—attacks, that is, which would not have been identified save for their connexion with pronounced cases. If in Devon and Cornwall case to case infection was actively operative, opportunities for transmission of the disease in this way would no doubt have been materially increased by these abortive cases, as well as by the others.

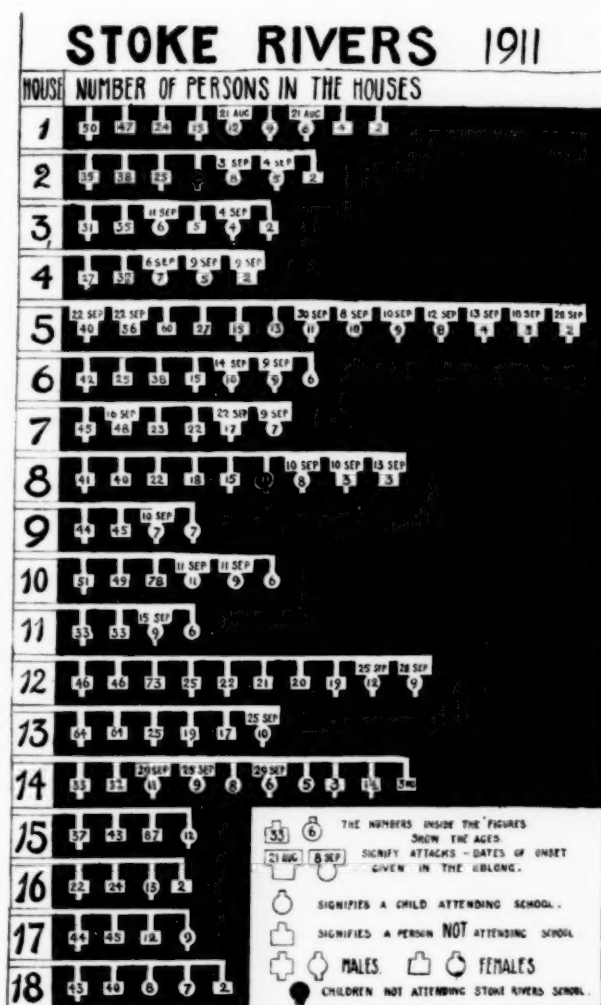
The possible occurrence of a prevalence almost entirely of the "abortive" type is illustrated by the Stoke Rivers outbreak, which, as I have said, is *not* included in the 154 cases specially dealt with. This Stoke Rivers outbreak is of special interest because of its association in the persons of school children with the village school. Had not cases of poliomyelitis been known to be present in the county, the illness associated with this school would probably never have become the

subject of close inquiry. The school was not closed on account of this outbreak. In some of the cases in the group no medical practitioner was in attendance, and when the acute symptoms of particular sufferers subsided in two or three days these children returned to school. In only two of the first series of cases here were medical practitioners called in, and, on the facts before them, both considered the illnesses to be due to some common food infection—the chief symptoms being fever, headache, and vomiting.

The school had been closed in ordinary course for the holidays on August 4, and re-opened on September 4. On September 13 one of the medical men in attendance on certain patients informed Dr. Harper, the Medical Officer of Health, that a child, absent from school, had facial paralysis. Dr. Harper then went to the school and ascertained that ten children were absent through sickness; and he accordingly visited these children at their homes. As a result he forwarded me a short report on the outbreak of illness which he considered due to a mild form of poliomyelitis. The outbreak was then exhaustively investigated by Dr. Adkins, the County Medical Officer of Health.

Stoke Rivers is a small village about seven miles distant from the town of Barnstaple. The school is but a small one, there being only forty-one children on the register; as already stated, there are eighteen houses, having a population of 119 persons. Of these persons sixty-one are over the school-attendance age, and were not attending school; forty-three were attending school, although two of the forty-three were not attending the Stoke Rivers school; fifteen were below the school-attendance age and did not attend school. In this community of 119 persons there were thirty-six attacks by poliomyelitis which were more or less definite; although only three developed paralysis, two suffered from facial paralysis and one, a lad aged 17, in house numbered "7," remains paralysed in both legs. In addition to the thirty-six there are nine others who may possibly have suffered in a minor degree. Of the definite thirty-six cases, four were over and six under the school-attendance age, and twenty-six were habitually attending school. Neither of the two scholars mentioned above as attending another school suffered attack. A diagram illustrating the facts elicited as to residence, age, school attendance, attacks and dates of onset has been prepared.

It is to be noted that the first two cases of the illness at Stoke Rivers occurred on August 21, at a time when the school had been closed seventeen days, the patients being two children living in house 1. The next case occurred on September 3, and this child's brother did not



go to school on the next and opening day (September 4), as he was attacked by headache and vomiting. But he went to school on September 5 to September 8, while still ill. On re-opening day, September 4, a child from a different house attended school in the morning, but was too ill to go there in the afternoon; and he had not returned to school by October 17. Thus, on the opening day of the school, there were children in the hamlet who were actually suffering, or had been suffering, from the malady, and the school therefore cannot be held responsible for the initial spread of the disease. The subsequent spread of the disease, however, may very possibly have been due to infection transmitted at school.

In this small community no less than 30·3 per cent. of the population suffered attack. Of those above the school-attendance age four persons, or 6·6 per cent.; of children under the school-attendance age six infants, or 40·0 per cent.; while of Stoke Rivers school children, twenty-six, or 63·4 per cent., were attacked. Of the eighteen houses, at the time that detailed inquiry was made (October 6), there were four houses in which no attacks had occurred (houses 15 to 18). There were three houses which had each one case (houses 9, 11, and 13); six houses had each two cases (houses 1, 2, 3, 6, 10, and 12); four houses each had three cases (houses 4, 7, 8, and 14); and the remaining house (No. 5) had nine cases. The point of interest in this connexion is that in eighteen Stoke Rivers households, all presumably liable to invasion by the disease, fourteen houses (77 per cent.) suffered invasion between August 21 and September 30, and that of these, eleven (61·1 per cent.) had each more than one inmate attacked.

Considering the attacks in Devon and Cornwall collectively, any theory of personal communication being the principal factor at work presupposes a multiplicity of mild cases, and has therefore its limitations. For (1) if Stoke Rivers be set aside there is only a limited number of known abortive cases that were associated with the definitely pronounced cases. Of 140 cases concerning which I have detailed information, twenty-seven, or 19·2 per cent., exhibited no symptoms of paralysis; but of these twenty-seven very few could be described as abortive cases. (2) The poliomyelitis was dispersed all over both counties within a short space of time, and apparently the appearance of the disease in many widely separate parts was almost simultaneous, so that it could not well be explained by abortive cases unless these were present in enormous number over a wide area. (3) It is not known how long abortive cases (if they are infectious) may act as carriers of the virus. This question of course arose, and it could not be satisfactorily answered.

(D) Healthy Carriers.

Some suggestion was forthcoming of the operation of healthy carriers in disseminating the disease. For instance: A small farmer, "B," sold a horse to another, "W," and according to the custom of the county "B" had to deliver the horse at "W's" farm. "B" himself took the horse there, and he stayed for the afternoon meal with "W's" family. The distance between the two farms as the crow flies is 10 miles, while the place at which the horse was delivered is an isolated farmhouse only approached by narrow lanes and finally reached by crossing two fields. There had been previously to "B's" advent no known cases of poliomyelitis in this particular neighbourhood; the "W" family certainly had had no illness, nor had any persons (other than "B") visited them. Inquiry was made concerning the horse in question; no history could be elicited to indicate that it had suffered from illness, and it appeared to be in good health. "B's" son, the only child in the family, aged 6, suffered an unquestionable attack of poliomyelitis, and the onset of his disease occurred on July 24. "B" delivered the horse to "W" on August 2, at a time when his son was still ill at home, and at the meal sat between two of "W's" children, aged respectively $5\frac{1}{2}$ and $2\frac{1}{2}$. During the night of August 8, six days later, both these children (boys) suffered acute attacks of illness. One is said to have been ailing with headache two days previous to this acute attack, the other to have been "lying about" for a day before the onset of these acute symptoms. Each boy became paralysed in both legs, and the elder suffered a much more severe attack than the younger, and with the onset of his illness he had severe epistaxis. On August 11 the mother of these patients, and on August 12 her infant son, suffered "abortive" attacks of the disease.

(E) Incubation Period.

In instances where presumption arose of direct infection from person to person, it appeared that a very few days may suffice for incubation of poliomyelitis. The subject, however, is greatly complicated by want of knowledge respecting duration of infectiousness (when present) in persons suffering from the malady, and by uncertainty as to relative abilities of acute and mild attacks, and of "carrier cases," to transmit it.

In the instance quoted of the man "B" who delivered the horse to "W" on the afternoon of August 2, the first symptoms noticed in the "W" children occurred on the evening of August 6, and on August 7. This is consistent with an incubation period of four or possibly five days.

In instances of multiple attacks in families, the dates of onset of the illness in persons attacked subsequently to the first case, often fail to afford satisfactory data for estimating the length of the incubation period. And there is always the difficulty in determining whether the secondary cases derived their infection from the first case or owed their illness to a cause common to them and to the first case.

(F) Intermediate Infection by Biting Insects.

A very large number of the patients were found to be flea-bitten; and in certain instances they were flea-bitten to an extraordinary extent. On the other hand, there were many patients who showed no trace of flea-bites. In certain of the invaded houses all the inmates were flea-bitten, though only one might be suffering from poliomyelitis.

Assuming a short incubation in the human subject, transmission of the virus by the flea would explain some of the difficulties—plurality of cases in particular houses, and seeming infection from a healthy carrier, for example. Infection in these ways by fleas is, however, far from explaining the main difficulty, namely, the simultaneous prevalence of the malady through both counties, unless it may be assumed that the flea or biting insect does not need to get its infection from a human source, and that in some way or other it becomes specially infective in country districts in the summer.

To summarize, the principal points in the epidemic on which I have commented in this paper are:—

- (1) The wide area over which the poliomyelitis was prevalent when systematically looked for.
- (2) The apparent increase of the prevalence with the hot weather and its fall after the earth and water temperature reached the maximum.
- (3) Its exceptional local appearance in intensive form, suggesting acute infectivity of a limited duration or range.
- (4) The occurrence here and there of groups of cases under conditions consistent with case to case infection, probably direct, but conceivably through biting insects.

(5) Strong suggestion that the healthy carrier may serve directly or indirectly as agent in transferring poliomyelitis to distant and exceptionally isolated dwellings.

(6) Indication that poliomyelitis may be represented locally, almost entirely by cases of the "abortive" type, and that abortive cases may on occasion be highly infectious.

(V) CERTAIN EPIDEMIOLOGICAL CONSIDERATIONS.

During the past few years work done on the pathology and on the virus of poliomyelitis has materially added to our knowledge of the disease, and gives hope that further investigation on these lines may make clear many points of its epidemiology at present obscure.

Meanwhile some points of analogy between poliomyelitis and other infectious disease on its first manifestation epidemically in this country deserve notice.

There is some analogy to the introduction of influenza in the early 'nineties; coming as it apparently did from nowhere, and rushing over wide tracts of country with extraordinary rapidity.

But in considering the whole subject of poliomyelitis it is of interest to note that its behaviour during its recent prevalence in England has a parallel in the behaviour of diphtheria, when first that disease appeared in our country at the middle of the last century. Diphtheria, when it came to be separated from scarlet fever, was a disease of rural districts.

The late Sir George Buchanan, writing in 1888, in introduction to Dr. Longstaff's classical report on diphtheria, states:—

"Dr. Longstaff's essay sets forth, as the result of abundant and careful examination of mortality statistics, the facts as to the distribution of fatal diphtheria in the districts of England and Wales during the twenty-six years ending with 1880; and he shows, in the first place, very notable varieties of incidence of the disease upon the several counties, not explicable by any geographical or geological consideration. He brings into strong relief evidence to show that the disease has always displayed a marked tendency to prevail in sparsely populated districts rather than in centres of population, and that, as years have gone on, this tendency has become less and less marked, so that, in later years, the chief urban districts seem to be approaching nearer than before to rural districts in their rate of suffering by this disease. Diphtheria alone among diseases of the zymotic class is found to have exhibited this peculiarity of special incidence upon sparsely peopled districts; and the facts brought together by Dr. Longstaff would certainly seem to suggest that the country has sent, and is increasingly sending, the causes of diphtheria into towns."

While I think it will be admitted that diphtheria remains very largely a disease of country districts, I doubt whether anyone would now state that it is not a disease of towns. Is it conceivable that poliomyelitis may follow a similar course to that taken by diphtheria?

Another sentence in the late Sir George Buchanan's reference to diphtheria in 1888 may be paraphrased and applied to poliomyelitis at the present day: "Our observations have no doubt increased our experience of poliomyelitis; while they have afforded as many illustrations as we can desire of our ignorance of the proximate cause of its prevalence in England."

For this ignorance to be dispelled continued collection and examination of facts is necessary; and the present paper will have served its purpose if it has in any way contributed to a better understanding of the occurrence of the disease in England in 1911, and as to the circumstances which must be explained by any sufficient theory of its causation.

Acute Poliomyelitis. An Analysis of Sixty-two Cases occurring in and around Edinburgh in the Epidemic of 1910.

By HERBERT BRUCE LOW, M.D.

DURING the summer and autumn of 1910 an unusually large number of cases of infantile paralysis occurred in the City of Edinburgh and the surrounding country. Sixty-two of these cases have been collected and certain facts concerning them subjected to an analysis. It will be easily understood that this number, sixty-two, does not represent the full extent of the epidemic. No doubt there would be many other cases, both in Edinburgh and in the country, which did not come under investigation.

Acknowledgments are due for the majority of the cases to the Honorary Physicians of the Royal Hospital for Sick Children, Edinburgh—Dr. Melville Dunlop, Dr. John Thomson, and Dr. J. Stewart Fowler; for three of the cases to Dr. Philip and Dr. Edwin Bramwell, Royal Infirmary, Edinburgh; twelve cases were out-patients or the private patients of practitioners.

INCIDENCE OF INFANTILE PARALYSIS IN THE ROYAL HOSPITAL FOR SICK CHILDREN, EDINBURGH.

To show the great increase of cases occurring during 1910, a comparison is made of the past five years. The last year before 1910 in which there was anything akin to an epidemic of this disease is shown to be 1906. This point is of some interest when we come to examine the rainfall for the past number of years.

	Year	1906		1907		1908		1909		1910
Number of cases	...	27	...	15	...	10	...	3	...	44

LOCALITY.

Fifteen of the cases came from the City of Edinburgh. They were all isolated cases, and careful inquiry failed to elicit any history of contact with other cases. Two cases came from the same street, but there was no intercommunication between the two houses. Two cases lived in the same tenement house, the one being on the first floor and the other on the third floor. The second of these two was not born till a month after the first took ill and he did not become paralysed until he was 6 months old—i.e., seven months after the first took ill.

The Edinburgh cases were divided according to the district of the city in which they lived. Five occurred in the district called St. Leonards, but there is no evidence of infection having been carried from one case to another. In each of six other districts there were one or two cases.

The remaining forty-seven are country cases, and all but one or two had been sent to Edinburgh for treatment. Of these, thirteen came from places north of the Forth; one from as far north as a village in Sutherlandshire; one from Perth, and the remainder from places in Forfar and Fifeshire. From only two places was there more than one case sent to Edinburgh, namely Kelty, which sent three cases, and Kirkcaldy, which provided four cases. The children of the three Kelty families attended the same school but the patients themselves were all under school age. At Kirkcaldy also, other members of the patients' family attended the same school, the patients themselves being too young. There seemed to be no other possible channel of infection and it was not considered probable that the school was to blame for spreading the disease. Twenty-three cases came from villages south of the Forth and west of Edinburgh. Four was the greatest number from one place. Ten places produced only one case each, and in some instances it was

ascertained that there were no other cases in these particular villages. Eleven cases came from south of the Forth and east of Edinburgh. Three was the greatest number of patients from one place, and again there was no evidence of infection having been carried.

The majority of the cases under notice came from the valley of the River Forth or the shores of its estuary. It is believed, however, that this fact should be explained on a basis of population rather than any possible geographical or climatic peculiarity.

THE AGE-INCIDENCE OF THE CASES.

The greatest number of cases occurred in children over 1 year and under 2 years. The number of cases at each age is as follows:—

						Cases
Under 1 year	...	...	...	...	...	6
Over 1 year and under 2	...	...	...	...	...	25
" 2 years and under 3	...	...	...	...	...	13
" 3 " " 4	...	...	...	...	...	9
" 4 " " 5	...	...	...	...	...	3
" 5 " " 6	...	...	...	...	...	1
" 6 " " 7	...	...	...	...	...	1
" 9 " " 10	...	...	...	...	...	1
" 18 " " 19	...	...	...	...	...	1
" 21 " " 22	...	...	...	...	...	1
" 29 " " 30	...	...	...	...	...	1
Total	...	...	...	...	...	62
Youngest patient	...	...	...	...	$\frac{2}{11}$ year.	
Oldest patient	...	...	...	...	29 years.	

SEX-INCIDENCE.

Male, 28 cases; female, 34 cases; total, 62 cases.

The three adult cases are all males. Emerson [3], in reporting on the Massachusetts epidemic of 1908, notes that there were seven cases of 18 years and over, and all were males.

THE OCCUPATION OF THE PATIENT OR PATIENT'S FATHER.

The diversity of occupations seen in the subjoined table shows, as was to be expected, that the nature of employment has no bearing on the causation of the disease nor in rendering one person more liable to be attacked than another. The fact that there are a greater number of miners or workers who come in contact with coal than of other occupations is easily accounted for by remembering that the part of the country from which most of the cases at the Royal Hospital for Sick Children are drawn is to a great extent a coal-producing district.

Miner	17	Platelay	...	1
Colliery engineman	2	Gamekeeper	1	
Engineer	4	Policeman	1	
Oilworker	2	Vanman	2	
Engine-driver	1	Mason	2	
" in India	1	Traveller	1	
Blacksmith	1	Insurance agent	1	
Coal carter	1	Woodcutter	1	
Pointsman	1			
Telephone linesman	1	Seaman	2	
Monotype operator	1	Barman	1	
Railway inspector	1	Warehouseman	1	
Tramway servant	1	Waiter	1	
Farmer or farm-servant	4	Baker	1	
Labourer	3	Dental student	1	

THE OTHER MEMBERS OF THE FAMILY.

The number of other children in the family of the patient is indicated in the following table:—

				Households
Where patient was the only child	...	...	...	9
Where there was 1 other child	...	...	...	12
Where there were 2 other children	...	...	...	14
" " 3 " "	...	...	...	7
" " 4 " "	...	...	...	8
" " 5 " "	...	...	...	6
" " 6 " "	...	...	...	3
" " 7 " "	...	...	...	1

Total other children, 148.

It will be seen that the number of children who, we may presume, were certainly brought in contact with the patients is 148, but none of these, or possibly only one, showed any signs of being attacked by the disease. This possible case was attacked, not contemporaneously, but three months previously. We may assume that the number, 148, does not represent the total of those that actually came in direct contact, for it is more than likely that the children would associate with others besides members of their own family; and a still greater number would run the risk of infection, if it is possible for the disease to be conveyed by means of a third person.

Each of the sixty-two cases occurred in a separate family.

No children, and only one adult case, were ill contemporaneously with the occurrence of the paralysis.

PRODROMAL SYMPTOMS.

From an examination of the table of prodromal symptoms it will be seen that in this epidemic there seems to be no outstanding symptom or group of symptoms present before the paralysis appears which gives any

certain indication that the patient is suffering from acute anterior poliomyelitis.

Armstrong [1] says that "keeping in mind the symptoms, such as somnolence, uneasiness, pain in head, neck, and along spine and nerve-trunks, together with weakness and slight spastic phenomena, accompanied by fever and vomiting, has enabled us to diagnose a number of cases before paralysis developed."

Comparing the symptoms mentioned by Armstrong with those of the present series, drowsiness and irritability (corresponding to "somnolence and uneasiness"), each occurred in twelve cases, or about one-fifth of the total number; pain, whether along nerve-trunks or otherwise, occurred in sixteen cases, or about one-fourth of the total number in the prodromal period. None of the sixty-two cases are indicated as having had slight spastic phenomena. Fever occurred in thirty-five and vomiting in twenty-seven—or, roughly, about half the cases.

To take another observer, Müller [8] thinks that in spite of the great variety of the prodromal symptoms, it is possible to make a correct diagnosis, before the appearance of paralysis, from the presence of the three cardinal symptoms, viz.: (1) profuse perspiration, (2) hyperæsthesia, (3) leucopenia. He gives other important symptoms as being weakness of the abdominal muscles, meteorism, and loss of abdominal reflex.

Of the present series of cases, nine had sweating and six profuse sweating. Owing to the cases not having been seen at the time of the onset of the disease, it was impossible to obtain accurate observations as to the presence of the other two "cardinal symptoms." The same remark applies to two, at any rate, of Müller's "other important symptoms."

If it is known that an epidemic is prevalent and one is, therefore, on the look-out for such cases, it will be possible to suspect an oncoming paralysis, but as a rule the diagnosis of these cases, with such a group of symptoms represented in this table, is still uncertain until the paralysis definitely develops.

The nasopharynx and the alimentary canal have been suggested as possible paths of infection, and the evidence of previous epidemics in many instances supports this suggestion. In an epidemic in Westphalia, in 1909, gastro-intestinal symptoms were observed in 90 per cent. of the cases [6]. Intestinal symptoms were exceptional in Müller's experience of the epidemic in Hesse-Nassau [8], but very frequently there was

"initial angina, bronchitis, or even bronchopneumonia." Faucial inflammation is spoken of as "an initial symptom in many cases" in an epidemic in Rhenish Westphalia [9]. In more than half the cases in an epidemic at St. Paul, U.S.A. [2], stomach or bowel troubles preceded the paralysis. Of the 150 cases studied in the Massachusetts epidemic of 1909, 126 had digestive disturbances [7].

To compare the above experiences with these Edinburgh cases: It will be noticed that five of the sixty-two cases gave a history of naso-pharyngeal symptoms, such as nasal catarrh; and seventeen cases gave alimentary symptoms, such as constipation or diarrhoea. Three cases had meningeal symptoms in the prodromal period, and six cases had no prodromal symptoms.

TABLE OF PRODROMAL SYMPTOMS.

	Cases		Cases
Fever	35	Headache	3
Vomiting	27	Severe headache	2
Malaise	25	Severe frontal headache	1
Pain and tenderness	16	Delirium	1
Drowsiness	12	Meningeal symptoms	3
Irritability	12	Twitchings of limbs and muscles	4
Constipation	10	Cough	1
Slight constipation	2	Nasal catarrh	4
Diarrhoea	3	Swelling of foot	1
Indigestion	1	Right eye closed	1
Thirst	1	Gradual onset of weakness	1
Profuse sweating	6	Sudden rigidity while patient was running about	1
Sweating	9	Feeling "as if there were stones in her shoes"	1
Slight sweating	2	No prodromal symptoms	6
Shivering	3		
Rigor	2		

DURATION OF PRODROMAL PERIOD.

In the Massachusetts epidemics of 1908 and 1909, the period of time between the onset of the fever, which in most of the cases appears to

DURATION OF PRODROMAL PERIOD.

	Cases
No prodromal period	6
12 hours prodromal period	2
1 day	8
2 days	8
3 "	11
4 "	1
5 "	3
6 "	1
1 week	13
9 days	1
10 "	1
2 weeks	4
3 "	1
1 month	1
2 months	1
Total	62

have been the first symptom, and the appearance of the paralysis, varied from hours to sixteen days [7]. In the present sixty-two cases the period of illness before the onset of paralysis varies from twelve hours to two months. Only three of the cases, however, are over the sixteen days, so that the prodromal period in this epidemic practically corresponds with that of the Massachusetts epidemic. In six cases the paralysis came on without any previous sign of illness.

THE ALLEGED CAUSE.

In some epidemics it has been noticed that frequently there is a history (1) of the patient having been swimming or wading, or (2) of a fall, or (3) that he has been exposed to cold, or caught a "chill." In many cases the paralysis has been attributed to "teething." In the Massachusetts epidemic of 1909, nearly half of the cases had been swimming or wading in water contaminated by sewage; of the 150 cases studied in this epidemic, 100 had been exposed to heat, cold or dampness, while thirty-four cases had a history of a fall [7]. In the present series a history of a fall is given in seven cases; of chill in seven cases; and of teething in four. None of the cases had been swimming or wading, so far as is known.

THE ALLEGED CASES.

	Cases
A fall	4
A fall and exposure to cold	1
A fall and fright	1
A fall upon the arm which was subsequently affected	1
Chill	4
Chill after wetting	3
Teething	4
Blow on the nose	1
Extraction of teeth under gas the previous day	1
No cause given	42
Total	62

DISTRIBUTION OF THE PARALYSIS.

With regard to the distribution of the paralysis, there are one or two points of interest to note. The commonest distribution was for both legs to be paralysed. Twenty-one cases had both legs affected in addition to paralysis of other parts; thirteen had loss of power of both legs but no paralysis elsewhere. Only five of the sixty-two cases escaped without having one or both lower limbs paralysed. In one or two cases the

distribution of the paralysis was somewhat peculiar. One case had only a circumscribed area of the abdominal muscles affected, so that when the child cried there was a bulging in the lower part of the abdomen about 3 in. long and 2 in. across. In one case the whole of the right leg except the foot and the whole of the left arm except the hand were paralysed. In the case where death occurred the left arm only was affected by paralysis, the onset being accompanied by cerebral and pulmonary symptoms. One case had paralysis of the bladder in addition to an involvement of both legs and the left arm. Only one case had the facial muscles affected, both legs, the back and the left arm being also paralysed. In one or two cases the onset of the paralysis was gradual and progressive, commencing with weakness followed by paralysis, the different parts being attacked in succession. The distribution of the paralysis is summarized in the following table:—

						Cases
Both sides of the body affected	...	...	...	...	...	36
Left side chiefly affected	...	...	...	...	...	11
Right side chiefly affected	...	...	...	...	...	13
Crossed paralysis	...	...	...	...	...	1
Abdominal muscles (circumscribed area)	...	...	...	...	...	1
Total	...	...	...	...	...	62

RECOVERY.

In the majority of the cases a great deal of the paralysis passed away, leaving, however, some part permanently damaged. It was noticed that, considering the extent of the paralysis, the amount of recovery in many instances was markedly more complete than when the disease occurs in a sporadic form. The back and neck muscles seemed to be those which recovered most quickly and most completely. Nineteen cases had the back and neck, or both, affected, and in only two was the recovery incomplete. The time taken for the parts to recover varied considerably. In some cases certain parts had recovered completely in three days, while in other cases the parts were still improving seven months after the onset of paralysis. Recovery is summarized in the following table:—

						Cases
Partial recovery	...	...	...	...	...	50
Complete recovery	...	...	...	...	...	3
No recovery	...	...	...	...	...	8
Death	...	...	...	...	...	1
Total	...	...	...	...	...	62

THE DATE OF ONSET.

The following table shows the monthly incidence of the sixty-two cases:—

	Month	Cases
1910	February	1
..	March	0
..	April	0
..	May	1
..	June	0
..	July	5
..	August	25
..	September	9
..	October	13
..	November	3
..	December	2
1911	January	1
..	February	1
..	March	1
Total		62

July, August, September and October are the four months during which the disease was most prevalent, fifty-two cases occurring during these months, leaving only ten cases to be distributed over the remaining ten months of the whole period considered. Of these four months, the number of cases which occurred in August very nearly equals the numbers added together which occurred in the other three months. This incidence corresponds closely with the seasonal incidence of the epidemics which have occurred both on the Continent and in the United States of America.

A point of difference is found when the weather conditions are examined. It has already been noted (p. 77) that the last year before 1910 in which there was anything akin to an epidemic of acute poliomyelitis in Edinburgh was 1906. The table of rainfall for the past ten years for Edinburgh shows that, taking the months of August, the wettest years were 1906 and 1910.¹ When we look for which month was the wettest we find that there was more rain in August, 1906, than in any other month of the same year, except October, and that of all the twelve months of 1910, most rain fell in August. The greater incidence of cases thus appears to correspond with the increased rainfall.

A contrary condition appears to have been more common in America and elsewhere. In Pennsylvania, 1907, when there was an epidemic

¹ In August, 1906, there were 5·08 in. of rain, and in August, 1910, there were 5·18 in. The nearest approach to this figure for the month of August was in 1904, when there were 4·3 in.

of acute poliomyelitis, the season is described as being "one of the driest in the history of the State." In Victoria, Australia, 1908, the epidemic occurred in a "very warm, dry season" [4]. In New York, 1908, the disease was most prevalent in August and September, but the season is said to have been "cool and extremely dry." In Massachusetts there was a deficiency of rainfall in 1908 of 7 in., and in 1909 of 3 in. on the whole year. The chart of the rainfall of Massachusetts in 1909, arranged by months, does not correspond with the prevalence of the disease in the State, arranged also by months, the driest month preceding the month of greatest frequency of the disease [7].

An examination of the table of mean temperature for Edinburgh does not show that the year 1906 or 1910 differed markedly in temperature from the other years of the decade. To summarize briefly for the year 1910:—

- (1) The highest rainfall for the year 1910 occurred in the month of August.
- (2) The same month had the highest mean temperature.
- (3) The greatest number of the cases occurred during this month.

CONCOMITANT SYMPTOMS.

The following table shows the symptoms which were present along with the paralysis:—

Symptoms	Cases
Pain or tenderness, or both ...	32
Constipation ...	7
Irritability ...	7
Sweating—profuse ...	5
Fever ...	3
Drowsiness ...	3
Thirst ...	4
Difficulty with micturition ...	3
Sore throat and rash ...	1
Emaciation ...	3
Loss of sensation ...	3
Cerebral symptoms ...	3
Vomiting ...	1
Epistaxis ...	1
Malaise ...	62

It is a point of interest that though it has been stated "there is no complaint of numbness, and there is never any loss of sensation" in this disease [10], three of the present series complained of loss of sensation; that is to say, ordinary sensation of the skin was lost, but at the same time there was pain in the limbs, particularly when moved.

The pathology of acute poliomyelitis and herpes zoster being analogous, it has been suggested that in an epidemic of the former it would be found that the incidence of herpes was also greater. None of the sixty-two cases under consideration suffered from herpes; and the incidence of herpes at the Royal Hospital for Sick Children, Edinburgh, in 1910, was not strikingly different from that of the previous four years.

INCIDENCE OF HERPES ZOSTER IN THE ROYAL HOSPITAL FOR
SICK CHILDREN, EDINBURGH.

	Year	1906		1907		1908		1909		1910
Cases	...	6	...	6	...	8	...	11	...	12

EVIDENCE OF CONTACT.

The apparent communicability of this disease from one patient to another, either directly or through the medium of a healthy person who acted as "carrier," has been a striking feature of many of the epidemics which have been investigated. In the cases under consideration the evidence that the disease was communicated to any patient from some other case is very meagre. In forty instances the parents of the patient had not heard of any other cases that had been similarly affected by paralysis. Nineteen had heard of other cases, in most instances *after* their own child had become paralysed; usually they knew of them only by hearsay, and were not personally acquainted with the families. In only one instance was the patient known definitely to have been in indirect contact with another case; in one instance there is doubtful evidence of indirect contact, and there is one instance where a patient was directly in contact with a case which possibly may have been one of acute poliomyelitis.

The tracing of the occurrence of contact is naturally more easy in the country districts than in the town. In one or two of the cases occurring in the country it has been possible, by obtaining information from the medical men, to learn that the patient was the only case of acute poliomyelitis which occurred in that place. In country places also, where the inhabitants are all more or less known to each other, if the disease had spread from one child to another, the parents would have been able to give the information that the children of their neighbours had been attacked. In the city, on the other hand, where there is a much greater intermingling of children, it would be impossible to trace definitely that a child had not been in contact with

another case unless *all* the cases which occurred were notified. Only fifteen, however, of the cases belong to the City of Edinburgh and forty-seven are country cases.

No other case known	...	...	...	...	...	40
Other case known, but no contact	...	...	...	...	...	19
Contact direct	...	...	...	...	...	? 1
Contact indirect	...	...	...	...	...	1 and ? 1
Total	...	...	...	...	...	62

SCHOOL.

In many instances in other epidemics, contact through attendance at the same school seems to have been the only possible means by which the disease could have been spread. A notable example of this is the Tröstena epidemic. In this district the inhabitants lived in peculiarly isolated circumstances, in detached farms, between which there was very little intercommunication. Within a period of six weeks there occurred forty-nine cases, and "the spread of the infection," says Holt, "seemed clearly traceable to the parish school" [4].

The following table gives the number of patients whose brothers or sisters attended the same school, and where it is possible, therefore, the infection might have been spread indirectly by this means. In twenty-eight cases no children of the family were old enough to attend school:—

School	Number of cases attending the school
Bruntsfield, Edinburgh	2
Abbotshall, Kirkcaldy	2
Kelty Public School	3
Broxburn Public School	2
Corstorphine Public School	2
Granton (the sisters of the patients were in the same class)	2
Tranent	2
No school	28

DOMESTIC ANIMALS.

An epidemic of acute poliomyelitis is reported as having occurred in Vermont, U.S.A., in 1894. At the same time animals were affected with paralysis, particularly horses and also dogs and fowls [5]. In Pennsylvania, in 1907, during an epidemic pigs and chickens were also affected [4]. Since then a number of medical men throughout the United States have reported the occurrence of the disease in horses. Krause, of Bonn, reports the occurrence of paralytic affection in chickens [11]. During the outbreak in Massachusetts in 1909, this

subject was thoroughly investigated, and it was found that in thirty-four out of eighty-seven families having domestic animals, sickness, paralysis, or death, occurred in these animals about the time of the paralysis in human beings. The relative distribution of the reported cases of animals was compared on the map with the distribution of the human cases, and the investigators came to the conclusion that no obvious connexion existed between the two classes of cases in Massachusetts in 1909.

In these sixty-two Edinburgh cases inquiry was made for signs of illness amongst the domestic animals. Fourteen of the families possessed animals, and in none of these were there any cases of illness, paralysis, or death, occurring about the time that the children were attacked by acute poliomyelitis.

CONCLUSIONS.

The chief conclusions arrived at from a consideration of the sixty-two cases collected in this investigation are:—

(1) The cases did not present any symptom, or group of symptoms, in the prodromal period which could be considered peculiar to the disease of acute anterior poliomyelitis.

(2) There is practically no evidence to show that any of the cases here considered were infected by contact with another patient.

Other points brought out by the investigation are as follows:—

(1) The nature of the employment of the patient, or patient's father, has no relation to the disease.

(2) Abortive cases were not common.

(3) The duration of the prodromal period varied from twelve hours to two months.

(4) In comparatively few cases was the attack attributed to any definite cause.

(5) The distribution of the paralysis in the majority of cases was bilateral.

(6) Five per cent. of the cases completely recovered, and in 14·5 per cent. there was no recovery.

(7) The duration of the paralysis in the parts which completely recovered varied from three days to six months, but there were parts which were still improving seven months after the onset of the paralysis.

(8) The month in which there were the greatest number of cases was also the hottest month of the year, and the month in which there was the highest rainfall.

(9) Concomitant symptoms were similar to those in other epidemics.

(10) There is practically no evidence that schools were responsible for the spread of the disease.

(11) There was no contemporaneous paralysis amongst domestic animals.

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DISCUSSION.

The CHAIRMAN (Dr. Arthur Newsholme, C.B.) said he felt sure he was rightly interpreting the feeling of the meeting in tendering to the readers of both the papers the best thanks of the Section. Unfortunately, both had been obliged to compress their remarks, but so far as Dr. Reece was concerned, during the next few days members would have an opportunity of studying a fuller report of his paper in the Report about to be issued by the Local Government Board, which, besides Dr. Reece's contribution, would contain an account of other outbreaks by Dr. Farrar, an account of the epidemiology of the disease, by Dr. Macewen, and of its pathology by Dr. Gordon. The two lessons which seemed to stand out from the two papers were, the need for further pathological investigation, and the need for minute epidemiological investigation of cases and outbreaks as they occurred. It was by those means that one could hope for further light on the pathology and epidemiology of the disease which was still needed.

Sir SHIRLEY MURPHY said there was only one point in connexion with the very interesting subject under discussion which he wished to mention. He did not notice that either author referred to any contemporaneous disease in the

human subject, nor to the results of inquiries which had no doubt been made by them with regard to such disease. Dr. Reece mentioned mild and abortive cases of poliomyelitis, and the possibility that they might be concerned in the spread of the infection. But to him (the speaker) it did not seem to be at all necessary that the disease, if there was one, which was spreading and causing those symptoms, should always exhibit the form described as poliomyelitis, in cases definitely recognized as such. Dr. Bruce Low's remark as to herpes zoster being analogous, pathologically, with poliomyelitis, suggested to him the idea that anybody inquiring into herpes zoster in London a few years ago would doubtless have found many cases scattered about, and yet none of those patients would have been in communication with the others. Yet there was a possible connecting link as the cases occurred during an outbreak of influenza. He was himself one of the sufferers; this led him to make inquiries as to whether people were suffering from neuritis, and it was astonishing how many people did suffer from those attacks. If one had tried to trace the infection of one case of neuritis to another, the connexion would have been missing. But the fact that it was universally preceded by an attack of influenza was, he thought, a sufficient explanation of the circumstance. No doubt a contemporaneous disease in the human subject had been considered by Dr. Reece and Dr. Low, but as they did not mention it in their papers he hoped they would say something about it.

Dr. F. E. BATTEN said that there was no comparison between the relative values of the two papers read that evening. The one was based on cases collected from various sources and contained figures which gave a most erroneous impression of the incidence and mortality of the disease; the other, that of Dr. Reece, raised many questions of the greatest importance. In the first place, the speaker thought that all the 224 cases on which the paper was based might not be cases of poliomyelitis. It was impossible for him to criticize those cases without the clinical details; but if Dr. Reece's series included those cases which were recorded in the Falmouth epidemic at a former meeting of the Section, he was certain that he (Dr. Reece) had some cases which were not poliomyelitis. They were probably only a small proportion of the total number of cases. A very interesting matter referred to in the paper was the occurrence of death amongst animals at the same time as the occurrence of poliomyelitis; and that was one of the points which, in the future, should be thoroughly investigated. He hoped the Local Government Board would take up that line of research from the experimental point of view, for only from that standpoint could one hope for advancement in the elucidation of the nature of this disease. He did not know whether members of the Section were aware of the experiments which Marks had made with regard to poliomyelitis as it occurred in rabbits. Rabbits were known to be practically immune from poliomyelitis, they did not suffer from it as such. Only the observers Krause, and Meinicke and Lentz and Huntemüller, thought rabbits were susceptible, other observers had failed to transmit the disease. Marks had inoculated rabbits, and found that from seven to eleven days after inocula-

tion they died from convulsions in half an hour, but not of poliomyelitis. Marks carried that disease through a series of six rabbits and examined their spinal cords, and found that they did not show evidence of poliomyelitis. From the second, fourth and sixth of the series of rabbits he infected monkeys, and in each case produced typical poliomyelitis. Therefore in the case of the rabbit one had a carrier of the disease which did not exhibit the symptoms of poliomyelitis, but the disease was fatal to a certain number of them. Might not the same disease be carried by pigs and those various animals which were found to die suddenly during an epidemic of poliomyelitis? He suggested that that point should be most carefully investigated; certainly Marks's experiments were most suggestive. Similarly, as shown by Romer, a disease was known to occur in guinea-pigs which was transmissible, the virus of which was filterable, resisted glycerination, and produced symptoms of poliomyelitis in guinea-pigs. It arose spontaneously, and could be transmitted through a series of guinea-pigs. One could not produce poliomyelitis in guinea-pigs by inoculating the virus of poliomyelitis as it occurred in man. Dr. Reece referred to the epidemic at the Stoke Rivers school. He wished Dr. Reece had spent a long time in investigating that one small epidemic: had he done so, more real knowledge might have been the result than from the whole of the investigation in the two counties. There were many questions he would like to ask, which no doubt would be answered by the Local Government Board Report. For instance, did the children have their meals in school? What drinking cups did they have? Did they pass sweets from one to the other? Sir Shirley Murphy had referred to the fact that herpes zoster occurred epidemically, and it would be very interesting to test the blood of such cases by the serum test against the poliomyelitis of the monkey. This had been done in Germany by Müller with regard to herpes zoster, but, unfortunately, the control monkey did not die, so the experiment was inconclusive. It remained to be proved whether all cases of herpes zoster were due to the virus of poliomyelitis. He was interested to hear that Levaditi, on behalf of the Local Government Board, had carried out certain experiments and had produced poliomyelitis from an English virus. He hoped that English bacteriologists might, in the future, perform their own experiments, though he of course recognized the advantage of employing a bacteriologist so experienced in this disease as Levaditi.

Dr. SOLTAU (Plymouth) said his attention was drawn to the alarming increase, during the last year, in the incidence of poliomyelitis in the Three Towns in the south-west of England, and he collected together a report of seventy-three cases, which, as Dr. Batten had already pointed out, was of but comparative value except from the point of view of statistics, because he saw only a few of the cases. Still, he was able to examine a certain proportion of them, either during or after the acute stage. He believed the high mortality of the epidemic investigated by Dr. Reece suggested that many cases were either abortive or were missed, because the mortality was considerably higher than that of other described epidemics. Considering that 15 to 20 miles often separated two doctors, probably some cases were not detected. With regard

to the prodromata, he thought one of the most striking features was the pain; many cases which one was called to were thought to be rheumatic fever but turned out to be poliomyelitis. This was not sufficiently emphasized in the text-books. Another point was that the pyrexia did not seem to be a true indication of the severity of the disease. When he wrote his paper he had under his care a boy, aged 10, who had a temperature of 105° F., and was very ill. Although he was on the look-out for poliomyelitis he missed that diagnosis; it was only after the boy had been up and well that it was discovered he was limping slightly on one leg. His temperature had been 103° to 104° F. for a week. In the epidemic in the Three Towns there was no single house in which more than one case occurred, and although he did all he could to gather evidence of infection, he failed to prove contact in any case. This did not rule out the probability that contact did take place. He prepared a spot-map of the Three Towns, which showed that the incidence was scattered uniformly over a large area, and the crowded slum parts, which were demarcated by natural boundaries, almost escaped, whereas well-drained, high-standing parts occupied by the wealthier people suffered more severely. Dr. Reece did not report a case over 40 years of age. The only case he (the speaker) saw in late life was that of a man, aged 53, who developed paralysis of the left peronei. That he regarded as possibly poliomyelitis, and he included it in the series. The patient was a schoolmaster. He agreed with Dr. Reece as to the absence of cerebrospinal fever in Devon and Cornwall. In the last ten years he had seen no case in which the meningococcus was discovered, though he had systematically lumbar-punctured all suspicious cases. The maximum number of cases in Plymouth occurred in August. The question of rainfall was interesting to him, because he advocated the theory that dust was a possible carrier of the disease. It had been said that at the time there were heavy storms of rain, but the rain in those counties seemed to have little effect on the prevalence of dust. Those who spent much time on the roads knew how great was the dust nuisance. He hoped the Local Government Board could be prevailed upon to try to mitigate that nuisance, in view of its possible agency in the extension of the disease. Possibly the great heat might have intensified the virus locally. He noticed much the same thing in Australia years ago in connexion with the virulence of tetanus in animals and man. There were definite areas in which the virulence was increased. Wading was indulged in by children, who after their paddling did not dry themselves, but in their walk to their houses gathered the dust from the roads and deposited it in their homes and possibly conveyed the virus home in that way. But it was necessary to find a more widely acting cause which would explain the occurrence of the disease in the more sparsely populated rural districts. He would like to hear Dr. Reece's opinion as to the value of closing schools. If the dust theory were accepted, the mere fact of closing the schools would seem to be a help to the spread of the disease, because the children, especially the boys, were then free to play about in the roads all day. He asked whether the closing of the schools in Devonshire was followed by an increase or a decrease in the disease, or whether it had any traceable effect.

Dr. ROBERT BRUCE LOW said he had never to his knowledge seen a case of anterior poliomyelitis in the epidemic form; but from what he had heard and read he believed it to be a new disease to this country; otherwise it could scarcely have escaped observation before, as, since the scare arose about cerebrospinal fever about twenty years ago, all cases which had nerve symptoms were noted not only by the general practitioner but by the Public Health officials. During his twenty years in general practice, in which he traversed a very wide area, he had not knowingly seen a case which would accord with the description of acute anterior poliomyelitis as now given; neither did he hear of such cases from his fellow-practitioners, with whom he was in close communication. The same observation applied to the time he served as a medical inspector under the Local Government Board, when he was sent to various parts of England and Wales, especially to remote rural districts, to investigate cases of anomalous illness; especially those which were associated with meningeal symptoms. He had seen many cases of paralysis following acute meningeal attacks, but they accorded with what was described in the books. In his opinion epidemic poliomyelitis was new to this country. It was comforting to find that poliomyelitis seemed to be at present largely confined to rural districts, for cases were thus more amenable to investigation than under the complex conditions existing in towns, where it would be difficult to trace the movements of persons and follow up clues. It was not likely that the full truth concerning the disease would be arrived at all at once, but by such important contributions as those read now before the Section knowledge would be built up until, step by step, the aetiology of this obscure malady would be completely explained.

Dr. HAMER desired to say a word about Dr. Reece's fifth conclusion, that there was a "strong suggestion that the healthy carrier might serve directly or indirectly as agent in transferring poliomyelitis." It had now become quite the fashion to make some passing reference to the healthy carrier. Dr. Farrar, in his recent paper, told the Section about "Mrs. Lin"; and now in Dr. Reece's paper there was "Farmer B." Of course it must be borne in mind that when Dr. Farrar went to Manchuria, and when Dr. Reece went to Devon and Cornwall, they had in their minds the recent British, German, and American literature on the subject of healthy carriers, and one might perhaps have reasonably expected them to encounter a certain number of instances of the kind in question. Such cases as those of Mrs. Lin and Farmer B were very good as far as they went, and he (Dr. Hamer) wished, like *Oliver Twist*, to "ask for more." If Dr. Farrar had discovered two or three hundred Mrs. Lins, and Dr. Reece had found a score or two of Farmer B's, one might begin to think seriously of the influence of the healthy carrier. Dr. Reece had said that his experience would "lead him to doubt whether there occurred mixed epidemics of poliomyelitis and cerebrospinal fever." But it was not suggested that cases of poliomyelitis and cases of cerebrospinal fever frequently occurred side by side in the same epidemic. In some outbreaks of influenza the

gastro-intestinal form of the disease was the common type: such outbreaks had occurred in recent years in the experience of members of the Section, for example, in Wandsworth and in the Thames Valley. In other instances—and they were much more common—they had to deal with the ordinary respiratory form of influenza. In yet other instances there were outbreaks in which the prevalent type was that which used to be termed in the old books (the name had almost gone out of use now) the nervous type of influenza. It was suggested that in the outbreaks of the type last named poliomyelitis might sometimes predominate, meningitis at other times. In an outbreak in which poliomyelitis predominated there might be one or two cases which were not readily distinguishable from cerebrospinal fever and vice versa. It did not necessarily follow, because there were many cases of poliomyelitis in Devon and Cornwall, and many cases of cerebrospinal fever in Irthlingborough, that therefore the two outbreaks were not manifestations of one and the same form of epidemic disease. It was not essential to the establishment of his (Dr. Hamer's) thesis that poliomyelitis and cerebrospinal fever and the respiratory form of influenza should all prevail at one and the same time in one and the same place. It was particularly noteworthy that the more anomalous outbreaks, such as that at Stoke Rivers and that of 1905 in East Herts, occurred in country districts; they did not apparently occur in London, though they had been looked for there. Whatever the reason might be, the London cases seemed to occur for the most part sporadically. In certain cases there had been difficulty in deciding whether the cases notified in London were cases of cerebrospinal fever or of poliomyelitis. Dr. Reece rang him up a few days ago concerning a case notified as cerebrospinal fever. He (Dr. Hamer) ascertained that a bacteriological examination had been made, but that no meningococcus could be found. Dr. Reece hinted that the case might be one of poliomyelitis, but a day or two afterwards a marked Widal reaction was obtained in high dilution, and the case was thereupon regarded as one of typhoid fever. The records made of notified cases of cerebrospinal fever and poliomyelitis in London presented points of resemblance, but the two sets of records could be differentiated from one another, inasmuch as one set was on blue forms and the other set on white forms.

Dr. FARRAR expressed the opinion that certain previous epidemics would require to be re-studied in the light of more recent experience during the last two years. He would like the opportunity of so re-studying one or two of the epidemics which he had himself investigated in previous years. At Irthlingborough there was a series of cases of what seemed to be cerebrospinal fever—four acute fatal cases occurred in one house. There were perhaps thirty cases in the village, which were characterized chiefly by spinal pain, tenderness and neuritis, not by paralysis. The doctor who attended those cases suffered from neuritis, and two cases occurred in a remote village where the patients apparently had no connexion with Irthlingborough, and he strongly suspected that the medical man acted as the carrier to those cases. A month or so after

his report was published there occurred in a remote farmhouse at Grafton-Underwood three very interesting cases. The first was that of a boy who lived at that farm, helping his father there. He had left school. He only left the farm on one occasion, going to a certain village to spend the week-end. On the following Friday he was definitely attacked with fever followed by paralysis. His brother slept in the same bed with him and had a febrile attack and more severe paralysis, affecting three of his limbs. The elder sister, who nursed the two boys, was attacked, and when he saw her she lay in bed paralysed. There appeared to be a connexion between these three cases and the Irthlingborough outbreak in the fact that a grocer's boy from Irthlingborough, who had not been himself attacked, and in whose house there had been no illness, went for the mid-week holiday to the village which the Grafton-Underwood boy had visited at the week-end, and occupied the same room. In the Grafton-Underwood cases the disease assumed the paralytic type, whereas in the Irthlingborough outbreak neuritis was a prominent feature. If some of the cases with which Dr. Bruce Low was concerned were re-studied something of the sort might be discovered. He did not think that cerebrospinal fever and poliomyelitis were easy to differentiate from each other clinically. A fulminant type of case occurred in some outbreaks of poliomyelitis, and he had come across the histories of two such cases in Westmorland. One was that of a healthy young lady, who went for a 20-mile walk on the Saturday; on the following day she took her Sunday School and did various other things. On Monday morning she woke up complaining of headache, and on Monday afternoon she was dead. In the same district there was another case which the medical attendant regarded as idiopathic tetanus. The patient started with a bilious attack and appeared to get better. But later he was seized with convulsions and died with acute fulminating symptoms. He believed Dr. Reece had a similar case, and he had heard of another at Stamford, which was not published. Poliomyelitis occurred in the fiancé of a servant of his who came over on Saturday. On the Monday the young woman had a letter to say "Poor John is ill and has been taken to the hospital!" There was a postscript to the letter, "Poor John is dead!" A brother of this patient suffered at the same time from poliomyelitis of paralytic type. A small outbreak was occurring in the village. Such cases might be relapses. The person might have a febrile attack, then feel a little better and get up, then have a relapse and die of coma and convulsions. Therefore it was necessary to keep the patients in bed if an attack of this kind was suspected. He could give several instances which seemed to him to point strongly to infection by healthy carriers, similar to those which Dr. Reece had quoted, and which would appear in Dr. Reece's fuller report. The subject of healthy carriers was very important, and the contacts of cases should be treated carefully, and an effort made to disinfect the nasopharynx in all contacts. As regards the period of incubation, in several cases in which exposure to possible infection had occurred on a single definite occasion, the incubation period seemed to have been exactly a week.

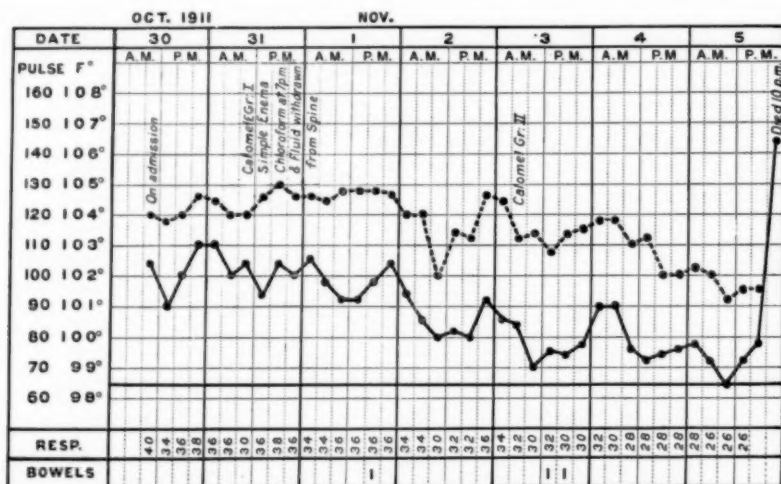
Dr. MACEWEN said he understood Dr. Batten to remark that no observer except Marks had succeeded in inoculating rabbits with poliomyelitis. He did not believe this to be the whole truth, because Levaditi also claimed to have inoculated a rabbit with poliomyelitis; that observer said the pathological appearances in that rabbit were more like those found in the human subject than that in any other animal treated experimentally. [Dr. BATTEN: He says, also, that it is an exceptional result, and he was unable to repeat it. He did it only that once, although he tried it several times.] Dr. Macewen rejoined that he produced the true disease in that rabbit, not a pseudo-disease as in Marks's case.

Dr. REECE, in reply, said his paper was mainly an attempt to bring into prominence the points on which we needed further knowledge in order to arrive at a better understanding of the disease under discussion. In regard to Sir Shirley Murphy's question, the occurrence of contemporaneous disease in the human was inquired into carefully in Devon and Cornwall, but he could find no evidence of any general disease prevalence, such as influenza. Inquiry was made as to herpes zoster, which was present in a certain number of the poliomyelitis cases. This would be shown in his report to the Local Government Board, together with an epitome of the clinical symptoms which he had been able to collect under the circumstances of his inquiry. In answer to Dr. Batten, he was present when the paper on the Falmouth epidemic was read, and he had notes of many of the cases referred to by the author, for the most part written by the medical attendants on the cases, and these notes did not altogether tally with some of the statements which the author mentioned. In his own list some of those cases were not included. In the official report about to be published there was a statement of the information which could be obtained about the disease in animals, but that was a very big question. If rabbits carried infection it might explain much, as rabbits were very widely dispersed in the counties, and many people got their living by killing and selling them. He inquired whether there was disease in rabbits, rats and other animals, however, but he could not hear of any. With regard to the outbreak at the Stoke Rivers school, his report would include a statement with regard to every house in the village, and disease in each household. The case was written up as completely as possible. Where it was stated that nine cases occurred in that outbreak which were conceivably poliomyelitis, there was no history of illness, but the patellar reflexes were lost. Wickman, in his latest book, said that in abortive cases there appeared to be an abolition of the patellar reflex in a certain number of cases. He could not find any cases associated with the schoolmaster who was attacked in Devon and Cornwall. With regard to the dust theory mentioned by Dr. Soltau, he did not see how the cases which occurred in Sweden could be attributed to dust; the disease there had spread to the north, where the country had been frozen for months. Although the greater prevalence occurred in hot weather, cases continued during the frost. With regard to closing the schools in Devon and Cornwall, there were two views taken. The County Medical Officer for Cornwall saw no reason for not

opening the schools or for examining the children before admission after the holidays; whereas the County Medical Officer in Devon would not allow the schools to be open until he could satisfy himself that they were freed from poliomyelitis. He could not say what happened, because his detailed inquiry ceased halfway through September, at the time the schools were opening. With regard to Dr. R. Bruce Low's suggestion that the disease was new to this country, there had certainly been sporadic cases for many years, but such extensive prevalence as occurred in 1911 seemed to be new. The prevalence of the disease occurred practically all over the world, and there had been epidemics in America and other countries. There was a report from Massachusetts dealing with the disease in 1910, and that was of great interest to him because, in the main, it supported what he had written, and it went fairly closely into detail. With regard to healthy carriers, in his report to the Local Government Board some other cases were referred to besides that of Farmer B, which could be added to Dr. Hamer's list.

With regard to Dr. Hamer's suggestion that cerebrospinal fever and acute poliomyelitis might be different manifestations of the same disease, it could be said that in cerebrospinal fever one could nearly always isolate a particular micro-organism from the spinal fluid, the *Diplococcus intracellularis*, whereas in poliomyelitis it was not found. And with cerebrospinal fever there were distinct pathological changes in the brain and meninges, and in poliomyelitis there was a distinct histological change in the spinal cord itself. His report included photographic reproductions of the sections of cords from cases in Devon and Cornwall, and from a fatal case in London. One case died twenty-four hours from the onset, three cases on the first day, three in two days, nine within three days, three cases within four days, and seven within five days of the attack. One did not die until the thirty-eighth day, and this was interesting, because she had attacks in the interval of what appeared to be acute mania. Lumbar puncture was done in that case without finding the diplococcus. An autopsy was not obtainable, though Dr. Burnet made a special journey across Cornwall to do the post-mortem. He agreed with Dr. Farrar that if one could look back at some of the epidemics of cerebrospinal illness in England one would find some reason for altering one's opinion on some of the cases. What was wanted was not only a means of excluding cerebrospinal fever—which could be done at present—but a laboratory test for poliomyelitis itself. A case occurred in Surrey, in which the child was taken to the workhouse infirmary after it had been ill three weeks. The medical officer concluded the child had cerebrospinal fever, and sought the assistance of the Local Government Board. He was advised to do lumbar puncture. The fluid was sent to Dr. Mervyn Gordon, who said it did not contain the *Diplococcus intracellularis*, and the character of the fluid was not inconsistent with the case being one of poliomyelitis. The child died. Dr. Mervyn Gordon made the post-mortem examination, and the sections of that cord showed the typical lesions of poliomyelitis. The previous history of that child was interesting. It was an adopted child living with a man

and his sister. The man, his sister, and the child were attacked with acute vomiting and diarrhoea, which they attributed to eating mushrooms, or to drinking tea on a certain day. The doctor in the village prescribed for them under the impression that they had some form of food-poisoning. The man recovered rapidly, but the woman died with symptoms of acute peritonitis. It was on her death that the child was removed to the workhouse infirmary, where he died, as had been said, from poliomyelitis, verified post mortem. He mentioned this case because (1) if lumbar puncture and special examination of the nervous system after death had not been made, the fact that the child suffered attack by poliomyelitis would never have been discovered. The illness presented several points of interest not ordinarily found in poliomyelitis.



Temperature chart of case of acute poliomyelitis in a boy, aged 8, under the care of Dr. Sells, in the Workhouse Infirmary, Guildford.

— = Temperature. - - - = Pulse-rate.

The temperature, as shown on the accompanying chart, rose suddenly to 106.4° F. immediately before death. Whilst at the infirmary the child exhibited ataxic symptoms, amongst others inability to pick up small articles. (2) Because of the doubt of the nature of the illness from which both the man and the woman suffered, and which began at the same time as the first illness of the child. The child's and woman's illness was suspected at one time to be enteric fever, but blood reactions were negative. It was, of course, possible that the child's poliomyelitis was superadded to another infection which it had received in common with the man and woman; but there might conceivably have been a common attack of all three persons by the causative agent of poliomyelitis.

Epidemiological Section.

February 23, 1912.

Dr. E. W. GOODALL in the Chair.

Diarrhœa in 1911.

By REGINALD DUDFIELD, M.B.

I do not propose to take up any time by discussing what is meant by the term "Infantile Diarrhœa," as I assume that we are all thinking of the same clinical picture. What I have to submit for discussion this evening falls under three main heads, viz.:—

(I) A brief comparison of the mortality experienced in London during the past summer with the records of the years 1901-10;

(II) A note of the special work which has been attempted in Paddington; and

(III) Some observations on the theories of the causation of the disease, more especially as to the part played by flies.

The programme submitted may appear too ambitious for a paper suitable for such an occasion as this, and I am fully aware of the deficiencies of this communication. I have found the time available all too short for the proper digestion of the material available; if, however, what I have to submit serves to provoke discussion, my present object will have been attained.

(I) MORTALITY DURING 1911 AND 1901-10.

According to the Reports of the Registrar-General there were 5,313 deaths from "diarrhœa" during the past year, of which total 4,310 were recorded in the third quarter of the year. Before proceeding to any consideration of those figures or comparison between them and the records of earlier years, attention must be given to the alterations

which were made last year in the significance of the heading and in the ages to which those figures relate.

Up to the end of 1910 the diarrhœal diseases in the general mortality tables included the deaths, at all ages, due to "Infective Enteritis, Epidemic Diarrhœa" and "Diarrhœa (not otherwise defined)." Last year, following on the adoption of the International List of Causes of Death, the heading was altered to "Diarrhœa and Enteritis," and the age-period (so far as concerned the returns in the Quarterly Reports, the corrected figures for London) was limited to 0-2 years. Evidently, therefore, before any comparisons can be instituted the new List must be examined to see how far it accords with the previous classification, and some factor must be sought to adjust the figures to the new age-period.¹

The "Manual of the International List of Causes of Death" issued by the Registrar-General affords the information necessary for a comparison of the two headings. The entry "Diarrhœa and Enteritis"—Nos. 104 and 105 of the new List—is made up of the following sub-heads:—

A—Infective enteritis.

B—Diarrhœa—not returned as infective.

C—Enteritis—not returned as infective.

D—Gastro-enteritis—not returned as infective.

E—Dyspepsia (under two years).

F—Colic.

G—Ulceration of intestines.

H—Duodenal ulcer.

Sub-heads *A* and *B* are the old headings "Infective Enteritis, Epidemic Diarrhœa" and "Diarrhœa (not otherwise defined)"; *C* and *D* correspond to "Enteritis (not epidemic)" and "Gastro-enteritis," and *G* and *H* to "Ulceration of intestines." Sub-heads *E* and *F* do not appear in the old tables. Deaths which in future will be included under *E* ("Dyspepsia, under two years") were formerly entered under "Want of Breast Milk" (0-1) and "Other Diseases of the Digestive System" (1-2), and those to be included under *F* ("Colic"), under "Other Diseases of the Digestive System" (children), and "Intestinal Obstruction" (adults). What may be termed as the

¹ Dr. Stevenson tells me that the data necessary for re-arranging the statistics based on the new List to agree with the tables hitherto in use will be included in the Annual Reports for 1911 and onwards. What I have to attempt on this occasion is just the opposite—namely, to convert the old tabulation to the new.

TABLE I.—DEATHS FROM "DIARRHOEA."

All ages : Persons	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911
Epidemic diarrhoea	1,644	1,093	1,430	2,908	2,044	2,706	726	1,522	740	604	4,353
Diarrhoea	2,290	1,494	1,496	1,083	1,256	1,675	681	989	771	668	2,362
Gastro-enteritis	490	320	368	487	446	679	365	475	436	377	748
Enteritis	711	506	559	625	523	707	519	581	477	469	75
Ulceration of intestines	163	163	163	163	163	163	138	148	127	127	65
Want of breast milk	80	93	137	136	136	99	109	101	90	90	65
Totals* (Reconstructed Published)	5,258 3,500	3,603 2,470	4,093 2,925	5,942 4,750	4,508 3,356	5,989 4,424	2,838 1,510	3,816 2,592	2,641 1,577	2,335 1,368	7,603 4,181
Aged 0-2 years : Persons											
Epidemic diarrhoea	1,578	1,053	1,389	2,793	1,950	2,581	684	1,448	699	563	3,905
Diarrhoea	1,969	1,258	1,243	1,483	1,090	1,472	580	882	683	599	2,082
Gastro-enteritis	418	272	316	416	386	613	304	413	370	313	443
Enteritis	526	349	374	416	419	588	404	459	378	376	5
Ulceration of intestines	3	3	3	3	3	4	6	5	1	1	5
Want of breast milk	80	93	137	136	136	99	109	101	90	90	65
Totals : Reconstructed	4,574	3,028	3,462	5,247	3,984	5,357	2,087	3,308	2,221	1,942	6,500
Variations from decennial averages											
All ages.											
Reconstructed :—											
Absolute	+1,185	-464	+20	+1,869	+435	+1,916	-1,535	-257	-1,432	-1,738	+3,530
Per cent.	+29.09	-11.39	+0.49	+45.88	+10.68	+47.04	-37.68	-6.90	-35.15	-42.67	+86.66
Published :—											
Absolute	+1,013	-417	+38	+1,863	+469	+1,537	-1,377	-225	-1,310	-1,519	+1,224
Per cent.	+35.08	-11.44	+1.31	+64.33	+16.24	+53.23	-47.69	-10.21	-45.37	-52.61	+44.86
Under 2 years.											
Reconstructed :—											
Absolute	+1,053	-493	-59	+1,726	+463	+1,826	-1,434	-213	-1,300	-1,579	+2,979
Per cent.	+29.90	-14.00	-1.67	+49.02	+13.14	+51.86	-40.72	-6.04	-36.92	-44.84	+84.60

* The totals here designated "Reconstructed" represent the uncorrected annual numbers of deaths from "Diarrhoea and Enteritis" according to the new classification. The "Published" totals, on the other hand, are the corrected numbers of deaths from "Diarrhoea" given in the Annual Summaries.

"Diarrhoea" heading of the new classification includes a good deal more than did the old. In fact, it agrees very closely with the "Diarrhoeal Diseases" of the infantile mortality tables which have been introduced in the Annual Reports within recent years.

Table I represents an attempt to show the numbers of deaths from "diarrhoea" in each of the years 1901-10 according to the classification of the new List. It should be noted that the figures have been taken from the Annual Reports—i.e., from the Table "London; Causes of Death at Different Periods of Life"—and are, therefore, crude numbers uncorrected for deaths of non-residents, &c., the "Published" figures are, on the other hand, taken from the Annual Summaries and are "corrected." In the second half of the table are shown the corresponding figures for children under 2 years of age. With all their imperfections these figures will serve to indicate the changes in the mortality from "diarrhoea" on a basis of classification similar to that now in use.

According to the provisional figures published in the Weekly Returns, there were 6,172 deaths at all ages from "diarrhoea" during the past year, as compared with an annual average of 4,073 during the preceding decennium, an increase of 51.1 per cent. It is necessary to go back to 1899 to find a year with a higher total (reconstructed) number of deaths, when 7,604 were recorded (Table I). If, however, the deaths at ages under 2 years be considered, last year's total (according to the Quarterly Reports) of 5,313 was exceeded in 1906, when 5,357 deaths were recorded, and nearly equalled in 1904 (total 5,247). Last year's total was 50.89 per cent. in excess of the average for 1901-10, a greater excess having been observed in 1906.

TABLE II.—MORTALITY-RATES PER 1,000.

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	Mean 1901-10
All ages											
Reconstructed ...	1.15	0.79	0.90	1.31	0.99	1.32	0.56	0.84	0.58	0.51	0.89
Old ...	0.85	0.54	0.64	1.04	0.74	0.97	0.33	0.57	0.34	0.30	0.63
Under 2 years											
Reconstructed ...	26.01	17.87	20.36	30.18	22.81	30.41	12.90	19.62	13.55	11.91	20.56
Old ...	19.23	12.21	14.48	23.96	17.05	22.35	8.06	13.31	7.94	7.01	14.56

The all-age total number of deaths during the past year was equal to a mortality of 1.36 per 1,000 persons as compared with an annual average of 0.89, such average being based on the "reconstructed" figures given in Table I. The rate at ages under 2 years was 32.92 per 1,000 as compared with a decennial mean—on reconstructed figures—of

20·56. The rates for the ten years 1901-10, calculated on estimated populations based on the provisional results of the last census according to the old and new classification, are given in Table II. That table is convincing proof of the need of care in comparisons of rates, based on the new classification with rates already published. Indeed, it may be said that the table establishes a claim for the publication of a series of corrections to adjust the valuable published records to the new table.

I have made new estimates (based on the results of the census of 1901 and 1911) of the populations of the cities and boroughs of the Metropolis for each of the ten years 1901-10, and from the data given in Table I have determined factors for converting the numbers of deaths from "diarrhoea" (old classification) at all ages into numbers of deaths from "diarrhoea and enteritis" (new classification) at ages under 2 years. The Registrar-General having kindly supplied me with a table of the provisional numbers of persons aged 0-2 years as determined at the last census, I have been able to calculate the mean rates for the decennium 1901-10 and the rates for 1911—representing the annual mortalities, at ages 0—2 years, corresponding to the number of deaths of the third quarters of the years. I have such rates for each city and borough, but on this occasion am submitting (Table IIA) only the rates for the Metropolis and the five groups of cities and boroughs used in the Quarterly Reports of the Registrar-General.

TABLE IIA.

Annual rates of mortality per 1,000 persons aged 0-2 years from DIARRHOEA AND ENTERITIS during the third quarter of the year.

London	...	Mean rate	...	1901-10 54·4	...	1911 92·2	...	1890 110·4
				Mean rate, 1901-10		Rate, 1911		
Group of cities and boroughs—								
Western	56·6	...	...	...	88·0
Northern	40·9	...	...	...	73·5
Central	52·7	...	...	...	105·0
Eastern	67·5	...	...	...	122·3
Southern	51·8	...	...	...	88·8

According to the foregoing calculations, in Paddington alone was the mortality in the third quarter of last year (50·4) less than the decennial mean rate (51·8).

Much as last summer departed from the average in temperature, the figures which have been given lend support to the view that the increase in mortality from diarrhoea did not exhibit an equally remarkable variation from the average, but to that point I shall return later on.

(II) WORK IN PADDINGTON.

It was in 1908 that the special visitation of cases of diarrhœa was first undertaken by my Department. In that year an investigation as to the bacteriology of the disease was carried out by Drs. Morgan and Ledingham, the results of which were included in the communication presented to this Section in February, 1909 [1]. Since then every known case of diarrhœa has been visited by the women inspectors, and as much information as possible collected. It should, however, be stated that the visits of the inspectors have not been made so much for the purposes of investigation as for helping the mothers in the care of their infants. I regard the statistical results of those visits as a by-product of the work, and never insist on every query contained on the report cards being answered. It has always seemed to me that better preventive work can be accomplished if the women inspectors' visits are friendly rather than official. Hence, you will understand the reason for the incompleteness of some of the statistics now submitted, which cannot compare with those published by Ballard [2] or Peters [3].

A word should be said as to the manner in which information of cases has been obtained. Arrangements have been made each year with the Staffs of St. Mary's and the Children's (Paddington Green) Hospitals whereby leave has been given for the outpatient papers of each day to be examined by a member of the Staff of the Department, and note to be taken of each case entered as "diarrhœa," or "diarrhœa and vomiting." Postcards have been supplied to the Poor Law District Medical Officers, who have kindly undertaken to send on the names and addresses of patients seen by them. A certain number of cases have been traced through the attendance at the infant consultations; and those visiting new-born children are required to report any cases heard of in the course of such visits. Leaflets as to the precautions to be taken against the disease are inserted in each booklet on "Infant Rearing" issued by the Department, invitation to notify any case being included in the leaflet. Last year I obtained permission from the Medical Superintendent of the Infirmary to search through his case papers. Except by making the disease compulsorily notifiable, I do not think much more could have been done to get a complete record of the prevalence of diarrhœa, but one cannot refuse to recognize the probability that by the methods relied on many attacks of diarrhœa are included among the "reported cases" which are not cases of genuine "infantile (summer)

diarrhoea," quite apart from the further fact that in not a small proportion of the cases the patients have been over 2 years of age. The foregoing considerations are of importance when dealing with the fatality among the reported cases.

In 1908 the "Diarrhoea Register" was open between the last weeks of July and October, and 301 entries were made during that period, the maximum number of entries for any week being 41 (week ended August 15). The actual number of cases occurring in the persons of children under 2 years of age was 248, of which 17 terminated fatally, only 9 of the deaths being, however, certified as due to "diarrhoea" (under one or other of its numerous synonyms). The reported cases that year formed but a small proportion of the real total, as the deaths of 38 other children were certified during the same period to have been due to "diarrhoea."

In 1909 the "Register" was opened on July 26 and closed on October 31, 205 entries being made during that period. The cases reported in the persons of children under 2 numbered 163, six of which terminated fatally, one death being certified as due to a cause other than diarrhoea. The total number of deaths *at all ages* that year was only 38, 28 of the deceased being under 2. The deaths in the third quarter were as few as 19.

In 1910 the Register was opened at the middle of June and closed about the middle of October. There were that year only 111 entries, of which 100 related to children under 2, among which there were 3 deaths. There were during the third quarter of that year 15 deaths at ages under 2 in addition to the 3 already mentioned.¹

Last year the Register was opened on June 12 and closed on November 25, thus covering a period of twenty-four weeks. The actual number of entries was 438, but the net number of cases among children under 2 was 359. The difference (79) included 26 entries relating to relapses among children under 2, 34 to cases in persons over 2, and 19 to cases in which the addresses given could not be traced. The search of the case papers at the Infirmary brought to light 28 other cases at ages under 2, and 10 cases at older ages.² The total number

¹ The Register was closed too early that year, as there were several deaths from diarrhoea before the end of the year.

² The total number of cases treated at the Infirmary between June 17 and November 15 was 56, 10 of the patients being over 2 years old. The deaths numbered 33, 2 of the deceased being over 2. The 46 cases and 31 deaths at ages under 2 represent a fatality of 67.4 per cent.

of cases at ages under 2 was, therefore, 387, 57 of which terminated fatally (not all from diarrhœa—according to the death certificates), there being in addition during the same twenty-four weeks 69 other deaths (from diarrhœa).

I do not propose to refer to the records of the years 1908-10, but to confine myself to those of last year, and I fear that I have very little

TABLE III.

Week ending		CASES REPORTED					DEATHS	
		St. Mary's Hospital	District Medical Officers	Others	Admitted to Infirmary	Total new cases	Registered locally uncorrected	Corrected return R.-G.
June	17 ...	6	—	—	1	7	—	1
"	24 ...	2	—	—	1	3	—	1
July	1 ...	7	—	—	—	7	—	1
"	8 ...	2	—	—	—	2	—	3
"	15 ...	4	1	—	—	5	—	—
"	22 ...	17	2	—	1	20	—	—
"	29 ...	14	2	—	—	16	—	1
August	5 ...	12	1	—	3	16	—	5
"	12 ...	21	7	3	1	32	1	9
"	19 ...	43	3	4	3	53	3	18
"	26 ...	65	6	7	2	80	3	10
September	2 ...	25	2	1	3	31	2	13
"	9 ...	21	1	4	1	27	2	13
"	16 ...	23	3	—	2	28	2	10
"	23 ...	10	3	—	2	15	6	7
"	30 ...	8	1	1	1	11	3	6
October	7 ...	6	—	—	4	10	2	8
"	14 ...	3	—	—	2	5	—	3
"	21 ...	6	—	—	—	6	2	4
"	28 ...	5	—	—	—	5	—	2
November	4 ...	2	—	—	1	3	—	1
"	11 ...	1	—	—	—	1	—	—
"	18 ...	3	—	—	—	3	—	1
"	25 ...	1	—	—	—	1	—	—
Totals	...	307	32	20	25	387	26	118

that is new to record. Table III shows the numbers of new cases and relapses entered in each week, the numbers of (unreported) cases admitted to the Infirmary, and the deaths registered. Table IV, which shows the distribution of the cases and deaths according to the dates of onset of the attack, is, however, the more interesting. It should be explained that the term "dying" has been used for known cases ending fatally, and that of "death" for fatal cases not reported during life.

Duration of Epidemic.—The date of onset of the attack was noted in 405 cases out of the total of 456 (cases and deaths). The weekly

distribution of the dates of attack (see fourth column of Table IV) indicates that the epidemic commenced during the week ended July 15, and terminated during that ended September 30, covering a period of eleven weeks. If, however, the deaths be selected as an indication of the duration of the epidemic, then—taking any excess of 5 (the weekly

TABLE IV.

Week ending				DATES OF ONSET OF ATTACK				DATES OF DEATH		
				Recover- ing	Dying*	Deaths	Cases and deaths	All deaths	Dying	Deaths
June	10	...	...	2	—	—	2	—	—	—
"	17	...	...	5	1	1	7	1	—	1
"	24	...	...	6	1	—	7	2	2	—
July	1	...	...	4	1	—	5	2	1	1
"	8	...	...	5	2	—	7	1	—	1
"	15	...	...	12	—	—	12	—	—	—
"	22	...	...	12	3	1	16	—	—	—
"	29	...	...	16	3	1	20	2	1	1
August	5	...	...	22	4	6	32	6	1	5
"	12	...	...	43	9	11	63	12	4	8
"	19	...	...	47	5	12	64	16	7	9
"	26	...	...	41	6	8	58	17	4	13
September	2	...	...	21	2	2	25	15	3	12
"	9	...	...	21	2	5	28	6	3	3
"	16	...	...	14	2	—	16	12	6	6
"	23	...	...	12	1	—	13	8	5	3
"	30	...	...	5	2	1	8	5	3	2
October	7	...	...	2	1	—	3	9	7	2
"	14	...	...	4	—	—	4	2	2	—
"	21	...	...	4	1	—	5	3	3	—
"	28	...	...	5	—	—	5	2	1	1
November	4	...	...	1	1	—	2	1	1	—
"	11	...	...	1	—	—	1	3	2	1
"	18	...	...	2	—	—	2	—	—	—
"	25	...	...	—	—	—	—	—	—	—
December	2	...	...	—	—	—	—	1	1	—
Not known	...	...	...	20	10	21	51	—	—	—
Totals	...	...	...	390	57	69	456	126	57	69

* By "dying" is meant the reported cases which terminated fatally irrespective of the certified cause of death (see footnote, p. 109).

average number of deaths) as the test of epidemicity—the epidemic began in the week ended August 12 and terminated in the week ended September 15 according to the registered deaths (Table III). According to the dates of death (Table IV) the commencement fell in the week ended August 5, and the termination in that ended September 23. The last method appears to me to be the best, and I conclude, therefore, that diarrhoea was acutely epidemic for a period of eight weeks.

Sex-distribution.—There was a notable difference between the distributions of cases and deaths (cases not known during life). In the former the proportion was 82 (more exactly 81·6) cases among females for each 100 among males, and in the latter 138 (137·9). If the “dying” and “deaths” be combined the ratio becomes 100:121. The numbers on which these ratios are based are given in Table V.

TABLE V.

Ages (months)	KNOWN CASES						DEATHS	
	Total		Recovering		Dying		Males	Females
	Males	Females	Males	Females	Males	Females		
0—	1	—	—	—	1	—	2	1
1-3	19	13	10	9	9	4	7	14
0-3	20	13	10	9	10	4	9	15
3-6	33	30	21	17	12	13	7	7
6-9	33	28	31	24	2	4	10	4
9-12	32	29	29	25	3	4	1	9
12-18	47	40	47	37	—	3	1	4
18-24	48	34	47	33	1	1	1	1
Grand totals	213	174	185	145	28	29	29	40
Under 1 year	118	100	91	75	27	25	27	35
Aged 1-2 years	95	74	94	70	1	4	2	5

Age-distribution.—Of the 387 patients whose cases were reported, 33 were less than 3 months old; 63, aged from 3-6 months; 61, aged from 6-9 and 9-12 months; and 169, aged 1-2 years. The proportional distribution (per cent.) was:—

	Persons	Males	Females
At ages under 3 months	8·5	9·3	7·4
3-6	16·2	15·4	17·2
6-9	15·7	15·4	16·0
9-12	15·7	15·0	16·6
1-2 years	43·6	44·6	42·5

There was, therefore, no marked difference between the proportional age-incidence in the two sexes.

One comparison may be made with previously recorded proportions, namely, those in Table I of Ballard's Report [2], which related to the cases of diarrhœa treated by the District Medical Officers in Islington during the six years 1857-62. That table includes 1,451 cases in children under 2 years old, the proportional distribution being:—

At ages under 3 months	6·3 per cent.
3-6	14·6
6-9	14·5
9-12	11·5
1-2 years	55·0

The Paddington figures for last year show a lower proportion (11 per cent.) at ages above 1 year and increased (5 per cent.) at ages under 9 months. In the absence of information as to the proportion of artificially reared children included in the Islington figures, one can only hazard a guess that the increased incidence at ages under 9 months observed in Paddington is due to the greater frequency of artificial feeding of infants now prevailing.

The age-distribution for fatal cases was very different in the case of the "dying" and the "deaths," the proportional distributions (per cent.) being:—

				"Dying"		"Deaths"	
At ages under	3 months	...	...	24.5	...	...	34.7
	3-6 "	...	...	43.8	...	...	20.2
	6-9 "	...	...	10.5	...	...	20.2
	9-12 "	...	...	12.2	...	...	14.4
	1-2 years	...	...	8.7	...	...	10.1

Very considerable differences were also displayed by the proportional distributions for two sexes according to the two classes of fatal cases.

Fatality.—The 57 fatal terminations¹ among the 387 known cases represent a fatality of 14.72 per cent. (13.14 for males, 16.66 for females), the fatalities at each of the ages previously used being:—

				Persons		Males		Females	
At ages under	3 months	...	...	42.42	...	50.0	...	30.7	...
	3-6 "	...	...	39.68	...	36.3	...	43.3	...
	6-9 "	...	...	9.83	...	6.0	...	14.2	...
	9-12 "	...	...	11.47	...	9.3	...	13.8	...
	1-2 years	...	...	2.95	...	1.0	...	5.9	...

I have searched for some figures relating to cases and deaths from diarrhoea, based on recent observations, and the only series I have traced are those published by the Medical Officer of Health of Woolwich [4]. In his Report of 1909 he gives a table showing the numbers of cases notified by medical practitioners during the five years 1905-09, and the numbers of deaths among the notified cases. During that period 993 cases at all ages were reported, and there were 121 deaths. The cases included 786 of children under 2 years of age, of whom 115 died, giving a mean fatality of 14.6 per cent., a figure which is to all intents the same as that observed in Paddington last year. The proportional distributions of cases and deaths recorded by that observer were as follows:—

¹ The certified causes of death were as follow: Epidemic diarrhoea, 21 cases; epidemic infectious or zymotic enteritis, 12 cases; chronic enteritis, 9 cases; gastro-enteritis, 4 cases; enteritis, entero-colitis, 5 cases; inanition, marasmus, atrophy, 5 cases; whooping-cough, 1 case.

				Proportions per cent.		
At ages under	3 months	...	...	Cases	...	"Dying"
	3-6	"	...	9.9	...	19.1
	6-9	"	...	18.7	...	23.4
	9-12	"	...	18.4	...	21.7
	1-2 years	...	...	18.8	...	19.1
				34.0	...	16.5

These figures show a greater incidence on the younger children than was noted in the Paddington figures (cases), whereas the opposite holds good for the comparison of the "dying." I have compared those two because it appears that the numbers entered as "deaths" in the Woolwich table are equivalent to the numbers of "dying" in the Paddington figures.

The mean age-group fatalities recorded in Woolwich differ remarkably from those given for Paddington, as is shown in the appended comparison:—

				Percentages of deaths		
At ages under	3 months	...	...	Woolwich	...	Paddington
	3-6	"	...	28.2	...	42.4
	6-9	"	...	18.3	...	39.7
	9-12	"	...	17.2	...	9.8
	1-2 years	...	...	14.8	...	11.5
				7.0	...	2.9

Methods of Feeding.—In Table VI the cases and deaths at ages under 1 year have been analysed according to the method of feeding. Of the 218 children whose cases were known during life, no note of the method of feeding was recorded with respect to 10, the numbers of breast-fed children being 59, of artificially fed, 122, and of those on a mixed diet (those taking the breast with the addition of bottle or other food), 27. It will be seen that there was not a single death among the children reported as breast-fed, the distribution of fatal attacks being (as percentages): Breast-fed, *nil*; artificially fed, 84.6; mixed diet, 9.6; not stated, 5.7. An idea of the frequency of attack among the children on each diet can be obtained by comparing the proportional distribution of the cases with the records as to manner of feeding based on birth-visiting. To effect such comparison the figures in Table VI require to be re-grouped to harmonize with the table based on the birth-visiting of 1910, the last year for which data are available. Such comparison is set out below:—

Ages (months)	Children visited			...	Children attacked		
	Breast-fed	Artificially	Mixed		Breast-fed	Artificially	Mixed
0—	88.4	7.2	4.3	...	—	100	—
1—	79.6	13.2	7.1	...	33.3	55.5	11.1
2—	70.4	15.3	14.2	...	45.4	50.0	4.5
3—	66.6	22.3	10.9	...	26.1	59.6	14.2
Totals	82.0	11.2	6.7	...	28.3	58.6	12.9

TABLE VI.—METHODS OF FEEDING: CHILDREN UNDER ONE YEAR.

Method of feeding	Ages (months)											Totals under one year		
	0—	1—	2—	3—	4—	5—	6—	7—	8—	9—	10—	11—	M.	F.
Recovering	M. F.	M. F.	M. F.	M. F.	M. F.	M. F.	M. F.	M. F.	M. F.	M. F.	M. F.	M. F.	M.	F.
	—	1 2	5 5	3 —	2 4	2 3	1 3	5 6	5 2	1 3	— 2	3 1	28	31
	—	2 —	1 2	2 1	4 1	2 5	4 3	8 1	4 5	7 4	7 4	3 8	44	34
	—	—	1 —	— 1	— —	2 2	1 1	— —	3 3	1 1	— 1	5 —	13	9
Not stated	—	—	—	2 —	— —	2 —	— —	— —	— —	— —	2 1	— —	6	1
Dying	1 —	3 —	4 4	2 —	4 3	3 7	— 3	1 —	1 1	3 —	— 2	— 2	22	22
	—	1 —	—	1 1	— 1	1 —	— —	— —	— —	— —	— —	— —	3	2
	—	—	1 —	— —	1 —	— 1	— —	— —	— —	— —	— —	— —	2	1
	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Deaths	—	—	1 2	— —	— —	— —	— —	— —	— —	— 1	— 1	— —	2	3
	2 1	10 —	3 3	1 3	1 2	4 1	2 1	4 1	2 2	— 2	— 1	1 2	20	29
	—	2 —	— —	— —	— —	— —	— —	— —	1 —	— 1	— —	— 1	3	2
	—	—	—	—	—	—	—	—	—	—	—	—	2	1

The above figures sufficiently emphasize the dangers to which children fed otherwise than from the breast are exposed, and require no comment to "point the moral." One other comparison may be permitted in which the proportional distribution as regards feeding for all fatal cases will be given, and in this case, to obviate any criticism as to the proper allocation of the "not stated" cases, all such cases have been taken as breast-fed, although there is nothing in the tabulation (Table VI) to justify such an assumption.

Ages (months)	Children dying					
	Breast-fed			Artificially		Mixed
0—	100	...	...
1—	76.4	...	17.6
2—	82.3	...	...
3—	81.5	...	10.5
Totals	...	8.7	...	81.5	...	9.6

Of the 521¹ cases under 1 year included in the Woolwich figures, 44 (8.4 per cent.) were fed wholly from the breast, 72 (13.8 per cent.) were taking the breast and other foods (mixed diet), and the remainder 405 (equal to 77.7 per cent. of the total) were artificially fed. The methods of feeding of the children who died are not given separately.

The following figures relate to diarrhœa among 70 children under 1 year of age, and are extracted from Table XXX in Peters's monograph [2] :—

Ages (months)	Method of feeding					
	Breast		Artificial		Mixed	
	C.	A.	C.	A.	C.	A.
0—	9	...	1	...	2	...
3—	8	2	6	6	3	1
6—	7	3	6	5	8	1
9—	5	3	9	7	6	5
Totals	29	8	22	18	19	7

C = Children

A = Attacks

The attack-rates were—for all children 47.1 per cent.; among the breast-fed, 27.6; among those artificially fed, 81.8; and among those on a mixed diet, 36.8. The attack-rates for the individual age-groups are given below :—

Ages (months)	Rates per 100 children in each group					
	Breast		Artificial		Mixed	
0—
3—	...	25	...	100	...	33.3
6—	...	42.8	...	83.3	...	12.5
9—	...	60	...	77.7	...	83.3

¹ There is a difference of three between this figure and that given in the table of notifications, where the number of cases appears as 518.

No other figures of this character are known to me, and the only comparison which can be instituted with the Paddington data is that of proportion distribution, which is given below:—

Ages (months)	Peters				Dudfield		
	B.	A.	M.		B.	A.	M.
0—	...	—	—	...	40.6	53.1	6.2
3—	...	22.2	66.6	...	24.5	59.6	15.7
6—	...	33.3	55.5	...	36.6	50.8	13.1
9—	...	20.0	46.6	...	17.2	68.9	13.8
Totals	...	24.2	54.5	...	28.3	58.6	12.9

B = Breast-fed. A = Artificially fed. M = On mixed diet (breast, &c.).

The numbers of children and attacks dealt with by Peters were very small, and the "error of sampling" was probably large.¹ Subject to that observation, the two sets of figures are fairly comparable.

Before leaving this part of the subject mention should be made of the fact that at only 52 out of some 400 houses visited was any provision made for keeping food out of the living rooms, 28 of the 52 homes having larders (not always in use) and 24 safes on the staircase landing, by no means an ideal situation. It does not require much effort of the imagination to realize the chances of food contamination in the homes.

In 14 instances long-tube bottles were reported as in use. That number may, I think, be taken as representing the total frequency of such bottles, the women inspectors having been rigidly instructed to do their best to track out and suppress the use of long tubes. It represents 8.8 per cent. of the children attacked who were on any diet other than the breast alone, a proportion which contrasts remarkably with that given by the Medical Officer of Health of Woolwich in the Report already referred to. He records the use of long-tube bottles for the feeding of 194 out of 993 children attacked, or 19.5 per cent. of the total.

Housing.—In connexion with the housing of attacked persons I shall have to neglect the 28 cases which were traced by the examination of the Infirmary case papers, as no inquiries were made at the homes of the patients. The 359 reported cases (*see* Table III) came from 313 houses and 3 canal boats, 347 families or homes, being invaded, 12 of the families having two cases each. In 20 houses 2 families were infected, in 4, 3, and 1, 4. I shall, however, show presently

¹ The formula $\epsilon = \sqrt{p \times q \times \frac{1}{n}}$, where p = attacks ($\frac{28}{70}$), q = escapes ($\frac{42}{70}$) and $n = 70$, gives the value of ϵ for the attack-rate as ± 6.0 per cent. (approx.).

that the frequency of multiple cases greatly exceeded those figures. Passing over the canal boats, of the 344 families remaining 12 occupied whole houses, and 1 a tenement of five rooms.

It will, however, be of more interest to compare the housing conditions prevailing among families which had cases without a fatal termination (the "Recovery" series) with those among families in which one or more deaths from diarrhœa occurred (the "Fatality" series). To do this has involved a special sorting of the case cards to eliminate those duplicating the particulars relating to the same families. In the end I found that there were cards relating to 397 families which gave the required particulars, 289 cards relating to families without fatal cases, and 108 with. The differences between the two sets of figures are really very slight, as will be seen from a consideration of the following summary:—

Basement homes: 17·9 per cent. of all homes in the Recovery Table, and 12·8 in the Fatality; average number of occupants (all ages), 5·4 in the former series, 5·8 in the latter.

Ground floor homes: 25 per cent. in the Recovery Table, 33·7 in the Fatality; average number of occupants, 5·7 in the former series, 5·4 in the latter.

First floor homes: 32·5 per cent. in each series; average number of occupants, 4·6 in the former, 5·2 in the latter.

Higher floor homes: 24·6 per cent. in the Recovery series, 21·5 in the Fatality; average number of occupants, 5·1 in the former, 4·0 in the latter.

If the homes be grouped into (a) ground and basement, and (b) first and higher floors, there does appear to be a slight difference in favour of the upper floors, the combined percentages being:—

Ground and basement homes: 42·9 in the Recovery series, and 46·0 in the Fatality.

First and higher floors: 57·1 in the Recovery series, and 54·0 in the Fatality.

There was, moreover, a somewhat higher density of occupation in the Fatality series than in the Recovery. Unfortunately there is no comparison with the Borough as a whole, as the new census results are not yet available.

Relapses.—It is difficult to decide when a recurrence of diarrhœa in a patient is a "relapse" and when a "second attack." In Table I, Appendix, will be found notes of 54 such cases. Nine of the cases (Nos. 1, 3, 4, 12, 21, 23, 32, 35, and 40) are too incomplete for further

consideration. On the whole, I should be inclined to regard Cases 2, 6, 7, 8, 13, 16, 19, 20, 26, 27, 29, 34, 38, 39, 41, 43, 44, 45, 46, 46A, and 47-51 as "second attacks" and the remainder as "relapses." In 3 instances (Nos. 10, 15, and 40A) there were 3 recurrences of the diarrhoea, and in 9 instances (Nos. 8, 11, 12A, 22, 31, 36, 39A, 40A, and 49) the final issue was unfavourable. Those 9 deaths represent a fatality among patients subject to recurrence of the disorder of 16·36 per cent., as compared with 14·72 per cent. in the whole series

TABLE VII.—"RELAPSES"—ONSETS OF FIRST ILLNESSES.

Week ending	Ages—Months								Ages—Years			
	0—		3—		6—		9—		0—		1—2	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
June 10	—	—	—	—	—	—	—	—	—	—	1	—
" 17	—	—	—	—	—	—	—	—	—	—	1	1
" 24	—	—	—	—	—	—	—	—	—	—	—	—
July 1	—	—	—	—	—	—	—	—	—	—	—	—
" 8	—	—	—	—	—	—	1	—	1	—	1	—
" 15	—	—	1	1	—	—	2	—	3	1	—	1
" 22	—	—	—	—	—	—	1	—	1	—	—	2
" 29	—	—	—	1 (1)	2 (1)	—	—	1	2 (1)	2 (1)	2	—
August 5	—	—	—	—	1	—	—	1 (1)	1	1 (1)	—	—
" 12	—	1	—	2 (1)	1	—	1	4 (1)	2	7 (2)	1	2*
" 19	—	—	1	1 (1)	2 (1)	2	1	—	4 (1)	3 (1)	—	1
" 26	1	—	—	(1)	—	—	2	—	1	5 (1)	—	—
September 2	—	—	1	—	1 (1)	—	—	—	2 (1)	—	—	—
" 9	—	—	—	—	—	—	—	—	—	—	2	—
" 16	—	—	—	—	—	1	—	—	—	1	—	1
" 23	—	—	—	—	—	—	—	—	—	—	—	—
" 30	—	—	—	1	—	—	—	—	—	1	—	—
Totals ...	1	1	3	9 (4)	7 (3)	3	6	8 (2)	17 (3)	21 (6)	8	8*

* Add 1 female, aged 2.

NOTE.—Figures in parentheses represent cases terminating fatally.

(known cases). The intervals between the first and second attacks in the 25 cases so designated ranged from six to eighty-three days, with an average of 28·2 days. In 8 instances the second attack followed within fourteen days of recovery, in 11 within twenty-eight days, in 10 after intervals of from one to two months, and in two after a full two months of apparent good health. In Table VII the cases have been analysed according to the dates of onset of primary attacks and ages of the patients. There was a notable concentration of incidence on the weeks July 29 to September 2, all the cases which ended in death falling within that

period. On the whole females appear to be more subject to relapses than do males, but the difference is slight, and may be accidental. Method of feeding appears to be of some importance, as 6 of the relapses occurred in breast-fed children, equal to 10·1 per cent. of the whole of such children attacked; 23 in artificially fed, or 18·8 per cent.; and 7 in those on mixed diet (breast and artificial), or 25·9 per cent. In one case only was the use of a long-tubed bottle noted. These cases occurred in 53 homes, concerning 8 of which no note was made as to cleanliness, 18 of the remaining 43 (equal to 40 per cent.) being marked as dirty (4 homes), or fair (14 homes).

The housing conditions in 2 homes were not recorded, and of the remaining 51, 15 (or 29·4 per cent.) were situated in the basement, 5 (or 9·8 per cent.) were on the ground floor, 23 (or 45·1 per cent.) were on the first floor, and 8 (15·6 per cent.) on the higher floors. The facts may be stated in another way as proportions (per cent.) of the total infected homes on each floor furnishing relapses, the proportions being 29·4 per cent. for basement homes, 5 per cent. for homes on the ground floor, 19·1 per cent. for homes on the first floor, and 9 per cent. for homes on higher floors. The relapses were, therefore, relatively more frequent in basement and first floor homes. The former excessive prevalence was to be expected, the latter not so; and I am not at present prepared to offer any explanation, but would direct attention to the fact that 11 out of the 23 families living on the first floor comprised only 1 child each. It seems reasonable, therefore, to hazard a surmise that maternal inexperience may have had some share in the occurrence. The average numbers of occupants in the homes in which the relapses occurred were in certain cases *less* than in homes without relapses, as will be seen from the appended statement:—

	Houses with relapses				Without
Basement	...	5·8	...	...	5·4
Ground floor	...	4·6	...	...	5·5
First floor	...	4·2	...	...	4·7
Higher floors	...	4·9	...	...	4·8

On the whole I am inclined to the opinion that housing conditions—that is to say, the number of occupants per home—have very little, if any, influence on the prevalence of diarrhœa, but I do incline to the opinion that the floor on which the home is situated is not without effect.

*Multiple Cases.*¹—Taking the cases and deaths together, 419 houses were invaded by diarrhœa last season, the attacks numbering at least

¹ These are independent of "relapses."

556.¹ That total, however, cannot be accepted as the full count, as some of the invaded houses were not visited, and in 3 instances all information was refused. Multiple attacks were known in 84 houses, just over 20 per cent. of the whole number. Notes of the multiple attacks are to be found in Table II in the Appendix. That table can be summarized in the following form:—

Total houses invaded	...	...	...	...	...	...	412
Houses with 2 cases	...	...	...	...	...	...	59
" 3 "	...	...	...	...	...	...	13
" 4 "	...	...	...	...	...	...	11
" 7 "	...	...	...	...	...	...	1
In "multiple houses"—1 family invaded in ...							
2 families	...	...	...	...	...	...	41 houses
3 "	...	...	...	...	...	...	33 "
4 "	...	...	...	...	...	...	7 "
	...	...	...	...	...	...	3 "
							Cases
Total	...	...	...	...	...	...	130
Ages—0-1 year	...	...	...	...	...	...	116
1-2 years	...	...	...	...	...	...	11
2-5 "	...	...	...	...	...	...	3
5— "	...	...	...	...	...	...	—

Frequency of multiple attacks has been dealt with very fully by Niven [5], Sandilands [6], and Peters [3]. Niven, in 1904, in inquiries following 111 fatal cases, traced multiple attacks in 36 families (or 32 per cent. of the invaded families); Sandilands reported multiple attacks in 9 out of 35 families (25 per cent.); and Peters, 83 out of 174 invaded families (47 per cent.). The series now submitted includes 41 families with multiple cases, or 9·8 per cent. of the total (423).

In fig. 1 the facts relating to 8 houses where the largest numbers of multiple cases were observed are set out in diagrammatic form, the date of onset and recovery of attack in each of the 32 patients being shown. The full details of each house can be ascertained by reference to the number in Table I, Appendix.² The diagram lends considerable support to the opinion that "diarrhoea" is infectious. It will be seen that in the groups numbered 35 and 36 only did two or more persons fall ill on the same day. The diagram also exhibits a marked concentration of cases in the period August 20 to September 10.

Figs. 2 to 6 are similar diagrammatic representations of the duration of the epidemic in certain streets where diarrhoea was specially

¹ Not including 4 cases (1 fatal) on canal boats.

² In certain instances there was some uncertainty about the dates of the commencement (termination) of the attacks. In those instances the hard line begins (ends) with . . . instead of x. Intervals of apparent health between two attacks in the same patient are indicated by . . . between x and x.

prevalent. In these diagrams the hard line against each house number represents the interval between the onset of the first case and the termination of the last, any uncertainty as to the exact dates being indicated as in fig. 1. The numbering of the streets is not uniform, but in most of them the odd numbers are one side and the even on the other.

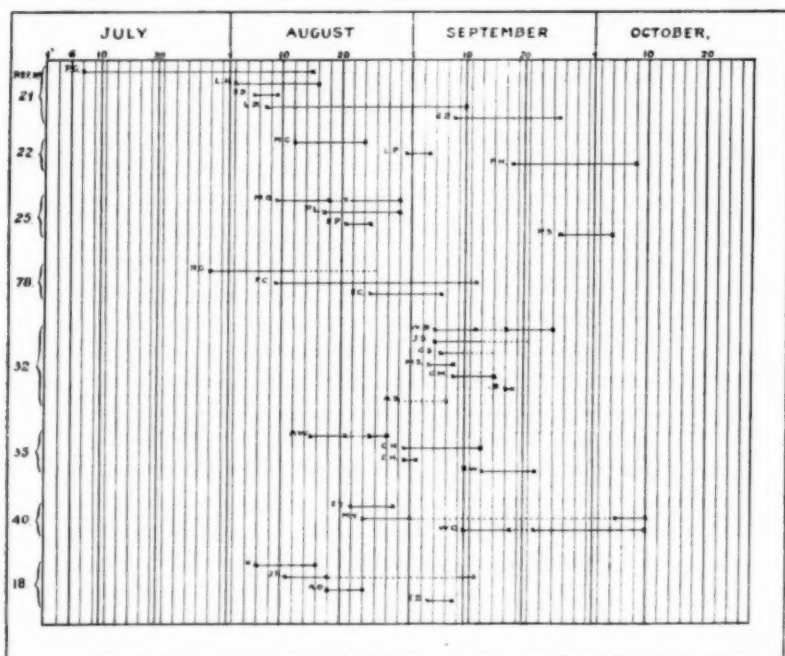


FIG. 1.

There is in all but one of the diagrams a similar concentration of cases similar to that noted in fig. 1. Diagram 2 is of special interest, not only because such concentration is not shown, but also because the streets therein named are in the immediate neighbourhood of the Paddington Basin, where such refuse is handled.¹

¹ Wharves whence house refuse from Paddington and parts of Marylebone is barged are on the north side of the Basin, Green Street, and North Wharf Road, being the most used thoroughfares for the dust-carts. At one of the wharves the house refuse is "manufactured." Manure is principally dealt with on the south side of the Basin, but the traffic in that commodity is now insignificant.

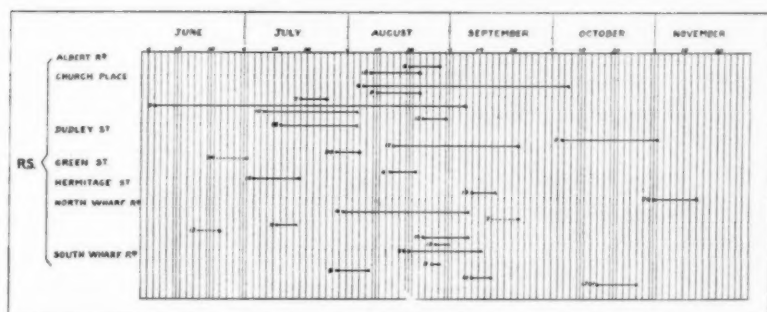


FIG. 2.

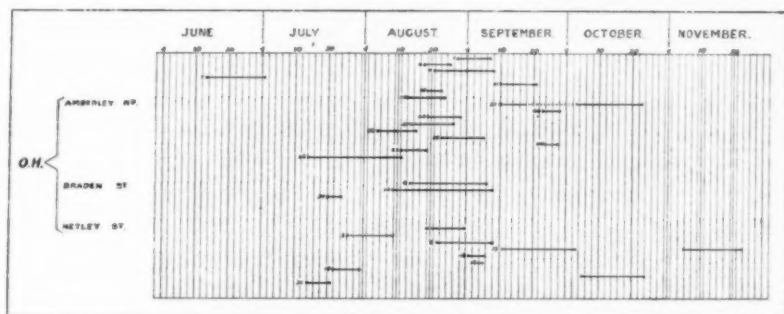


FIG. 3.

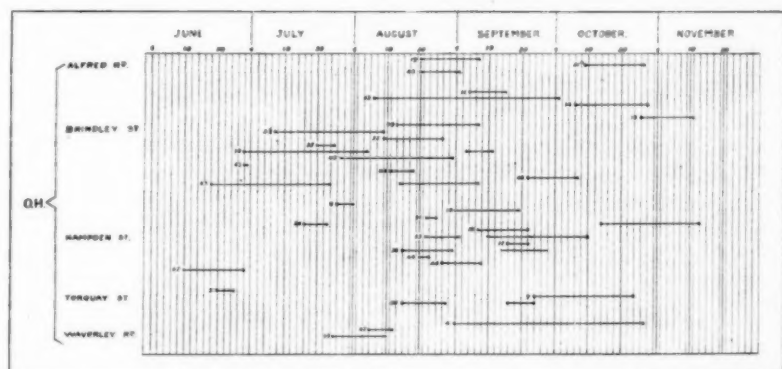


FIG. 4.

(III) THEORIES AS TO CAUSATION.

It is not my intention to attempt any consideration of the bacteriology of diarrhoea. All that can be said is that the case against the many organisms which have been brought to the bar is, so far, not proven. I want to submit certain mathematical considerations as to the relationship between meteorological conditions and the recurrence of the summer epidemics and the part which flies may possibly bear in the dissemination of the infective material.

The connexion between earth temperature and prevalence of diarrhoea was enunciated by Ballard in the Report already referred to [2]. He wrote (p. 2 of his Report):—

The summer rise of diarrhoeal mortality does not commence until the mean temperature recorded by the 4-ft. earth thermometer has attained somewhere about 56° F., no matter what may have been the temperature previously attained by the atmosphere or recorded by the 1-ft. earth thermometer.

The maximum diarrhoeal mortality of the year is usually observed in the week in which the temperature recorded by the 4-ft. earth thermometer attains its mean weekly maximum.

It was, I believe, Hope, of Liverpool, who drew attention to the effect on diarrhoea mortality exercised by a heavy rainfall, but I am not able to give any reference in support of that belief.

It is usual to adduce in support of those two theories charts and diagrams, showing how the curve of mortality rises (or falls) with the earth temperature and rainfall. I propose to consider the question of the relationship by the use of correlation co-efficients.

The first proof I have to submit is quite a general one, and is based on certain tables published by the Registrar-General in his Annual Summaries, first appearing, so far as I can trace, in that of 1907. In the first table he gave the infantile mortality in London during the third quarter of each year, from 1870 to 1907, in comparison with the mean earth temperature (at a depth of 3 ft. 2 in.), and the total rainfall measured during the quarter. The meteorological data were those observed at Greenwich, perhaps a trifle distant from the greater part of the Metropolis, but the usual data to accept as representing the weather conditions of London as a whole. By extending the tables referred to to include the returns for the third quarter of last year, a series covering a period of forty-two years has been obtained. Assuming, as I think I am entitled to, that the greater part of the

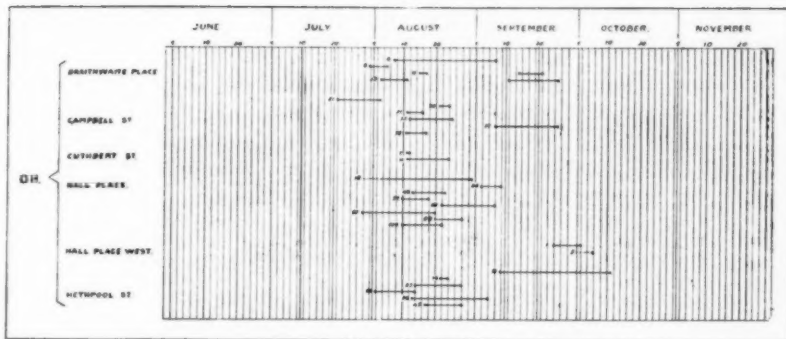


FIG. 5.

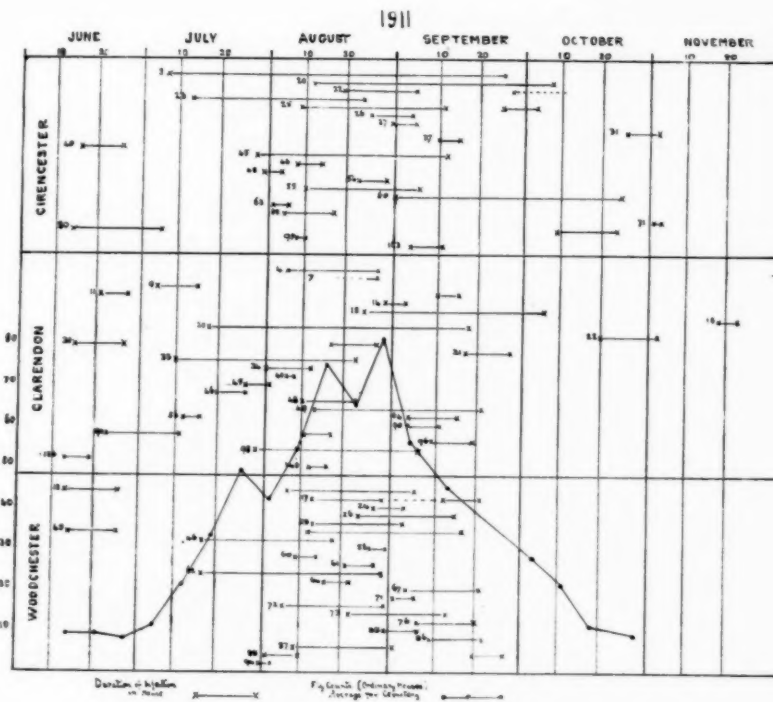


FIG. 6.

fluctuations in infantile mortality in the third quarter of the year have been due to the varying severity of epidemics of diarrhoea, the following comparison of last year's figures with the averages for the preceding forty-one years appears to justify the view already expressed, that the exceptional summer of last year was not characterized by an epidemic of diarrhoea of an equally exceptional character.¹

Averages 1870-1910	...	...	Infantile mortality	...	Earth temperature	...	Rainfall
" 1911	...	...	191	...	61.4° F.	...	6.7 in.
" 1899	...	...	203	...	64.0° F.	...	2.9 in.
"	...	...	277	...	64.0° F.	...	4.3 in.

In making such use of the total infantile mortality as a test of the severity of the diarrhoea epidemic of last summer, the reduction in mortality from causes other than diarrhoea should not be lost sight of. Even if it be assumed that the excess of 12 per 1,000 shown by the foregoing comparison, and assumed to have been caused by diarrhoea, has to be increased by an equal amount to allow for the reduction of mortality from other causes, last year's epidemic did not attain the proportions noted in many of the earlier years. In any case, last year's record compares very favourably with that of 1899, when the earth temperature attained the same level as last year and the rainfall was greater. The forecast made by the Medical Officer of the Local Government Board in his Report on Infantile Mortality [8] can, I think, be held to have been realized.

Correlation co-efficients have been calculated for:—

- (1) Infantile mortality and earth temperature (r_{01});
- (2) Infantile mortality and rainfall (r_{02}); and
- (3) Earth temperature and rainfall (r_{12}).

The values I have obtained are:—

$$\begin{aligned} r_{01} &= +0.85, \text{ with a probable error of } \pm 0.03 \\ r_{02} &= -0.30 \quad " \quad " \quad " \quad \pm 0.09 \\ r_{12} &= -0.37 \quad " \quad " \quad " \quad \pm 0.09 \end{aligned}$$

The means and standard deviations are:—

	Means	Standard deviations
Infantile mortality	191	± 41.02
Earth temperature	61.45° F.	$\pm 1.25^\circ \text{ F.}$
Rainfall	6.67 in.	$\pm 2.09 \text{ in.}$

¹ The assumption that diarrhoea is the principal cause of the annual variations of infantile mortality during the third quarter of the year is contrary to the results published last year by Leifmann and Lindemann, of Berlin [7]. According to their inquiries the high mortality noted when the air temperature -2 p.m. observations—rises above 73.4° F. (23° C.) is due to conditions simulating heat-stroke.

The co-efficients given above indicate a high correlation (positive) between earth temperature and diarrhoeal mortality, so that there appears to be some ground at least for regarding that mortality as in some way connected with earth temperature. I will ask you to note that I do not say "caused by." To do so would be to make an assumption which the co-efficients just given do not warrant. We can, however, go so far as to say that a high earth temperature may be expected to be associated with a high infantile mortality, assuming such mortality to be mainly due to diarrhoea. The co-efficient for mortality and rainfall is negative, not so large as in the case of the earth temperature, and the probable error is larger. The correlation between these two is, therefore, the reverse of that noted for earth temperature and mortality, and, moreover, not so reliable. The third co-efficient has been calculated solely because time failed for the calculation of the partial correlations.

In dealing with data covering so long a period as a quarter of a year, registered deaths are suitable for calculating correlation co-efficients. If, however, it be desired to determine the correlation from weekly data, registered deaths cannot be used, as a proportion of the deaths registered in any one week actually occurred in the preceding week. The data to be used must therefore be the deaths occurring week by week, and it would be preferable to use attacks rather than deaths. I have made both sets of calculations for the twenty-four weeks covered by the period during which the "Diarrhoea Register" was open in Paddington during the past year.

				Correlation co-efficients		Probable error
Attacks and air temperature	...	...	...	+ 0.55	...	± 0.09
" earth "	...	...	...	+ 0.68	...	± 0.07
" rainfall "	...	...	...	- 0.08	...	± 0.14
Deaths and air temperature	...	...	...	+ 0.19	...	± 0.13
" earth "	...	...	...	+ 0.51	...	± 0.10
" rainfall "	...	...	...	- 0.07	...	± 0.14

The rainfall used in this calculation was the average for the week obtained by dividing the total amount measured during the week by the number of days on which there was a measured amount of rain. Choice was made of this average, as it was thought that possibly there might be a closer connexion between a heavy rainfall (say, in one day) and a change in prevalence of diarrhoea, than between a uniformly wet week with a small amount on each day. The co-efficients obtained do not support that surmise.

Subject to a reservation which I will shortly specify, the co-efficients

between earth temperature and diarrhœa given above support the theory enunciated by Ballard. It should, however, be noticed that the co-efficient obtained between deaths and earth temperature is distinctly smaller than that obtained for attacks, and that the probable error is larger. The co-efficients for rainfall are in both instances small—even less than their probable errors—and cannot be deemed to be significant. It is evident from the differences between the co-efficients obtained by the use of the weekly day average and that obtained in the first example from the use of total rainfall, that the former method is useless.

I have calculated two other co-efficients for attacks and rainfall, measuring the latter by (a) the total amount during each week, and (b) by the number of days in each week on which measurable amounts of rain fell (wet days).

	Co-efficient	Probable error
Attacks and total weekly rainfall	- 0.29 ...	± 0.14
.. number of wet days per week	- 0.37 ...	± 0.13

In neither case is the correlation high, but the second, considered in conjunction with its probable error, suggests that a frequency of wet days rather than an occasional heavy rainfall is more inimical to the progress of a diarrhœa epidemic.

As touching the reservation to which reference was just made. The results set out above look very pretty and convincing, but the truth is that the trouble—or fun, according as one regards such mathematical gymnastics—only begins when these co-efficients have been determined. Before any safe conclusions can be drawn the suggestions made by the “total correlation co-efficients,” such as those now submitted, require to be tested by calculation of the “partial” co-efficients and regressions. Such calculations require much time, far more than has been at my disposal, and I have been compelled to leave this question at its most interesting and suggestive stage. I do not, however, intend to drop the question.

I pass now to the latest theory—viz., the dissemination of the infective material by flies—a theory which occupies a good deal of attention just now not only in connexion with diarrhœa but also with other diseases. Fly counts have been made by Niven in Manchester [9], Hamer in London [10], and doubtless many other observers. For the last three years such counts have been made each year in Paddington.

In the charts published by Hamer the general similarity of the curves of fly counts and deaths is evident, but difficulty has been felt in accepting the fly theory on account of the fact that the diarrhœa curve fades

away earlier than does that of flies. For that fact no valid explanation has as yet been suggested.

For the purpose of my fly counts eight stations have been arranged for each summer, the premises being chosen so as to have some of them near known sites of accumulations of refuse—e.g., dust wharves, manure sidings, &c.—others in localities free, so far as was known, from anything likely to attract flies, or to afford breeding grounds for large numbers.

TABLE VIII.

1911.

WEEK ENDING.	WHOLE SERIES.			REFUSE STORES.			ORDINARY HOUSES.			TOTAL NO. OF FLIES KILLED.	WEEKLY TOTAL OF FLIES.		
	NO. OF STATIONS.	NO. OF CEMETERIES.	AVERAGE NO. OF FLIES.	NO. OF STATIONS.	NO. OF CEMETERIES.	AVERAGE NO. OF FLIES.	NO. OF STATIONS.	NO. OF CEMETERIES.	AVERAGE NO. OF FLIES.		M.	H.	C.
JUNE 17	8	48	19	2	12	51	6	36	9	927	854	72	1
" 24	8	48	28	2	12	87	6	36	9	1366	1327	28	11
JULY 1	8	48	26	2	12	78	6	36	8	1234	1193	39	2
" 8	8	48	38	2	12	119	6	36	11	1836	1726	107	3
" 15	8	48	34	2	12	154	6	36	21	2625	2580	33	10
" 22	8	48	74	2	12	211	6	36	33	3742	3729	4	9
" 29	8	48	103	2	12	263	6	36	49	4948	4927	13	5
AUG 5	8	48	86	2	12	219	6	36	42	4152	4088	40	14
" 12	8	48	121	2	12	322	6	36	54	5815	5793	20	2
" 19	7	42	183	2	12	364	5	30	75	6636	6550	80	6
" 26	7	42	141	2	6	342	5	16	66	3116	3645	70	1
SEP 2	6	12	194	2	4	419	4	8	81	2328	2290	38	
" 9	7	38	148	2	10	408	3	28	56	3643	3633	10	
" 16	6	36	104	1	6	398	3	30	43	3746	3644	53	17
" 23	8	40	77	2	8	228	6	32	39	3082	3033	40	9
" 30	8	48	44	2	12	167	6	36	3	2121	2084	28	9
OCT. 7	7	40	45	2	10	93	5	30	28	1791	1701	19	7
" 14	8	42	23	2	10	41	6	32	21	1079	1075		4
" 21	8	40	13	2	8	29	6	32	11	609	591	6	12
" 28	6	24	16	1	4	19	5	20	9	250	233	9	8
PER CEMETERY.										57036	56096	746	194

Two "fly cemeteries" were exposed at each station and changed three times a week—viz., on Mondays, Wednesdays and Fridays. The weekly totals ought, therefore, to have represented the numbers caught by 48 of such "cemeteries," but our luck has been very variable. Householders will go away for holidays and strikes are not unknown, both of which occurrences have interfered with the work. Table VIII gives the total number of flies enumerated week by week during the past diarrhoea season, and the actual number of "cemeteries" used. After considerable thought I came to the conclusion that the only reliable measure of fly prevalence was the average number of flies caught

per "cemetery" exposed. Table VIII shows the general averages and separate averages for cemeteries exposed near "refuse stores" and for those exposed in "ordinary houses."

Fig. 7 has been drawn to compare the curves of fly count (weekly average per effective cemetery), earth temperature (mean weekly at 3 ft. 2 in.), and rainfall (total fall averaged for seven days) with those of dates of onset and deaths. It will be seen that while the curves of attacks and deaths rise in fairly close agreement with the theory propounded by Ballard, and the maximum number of cases was recorded

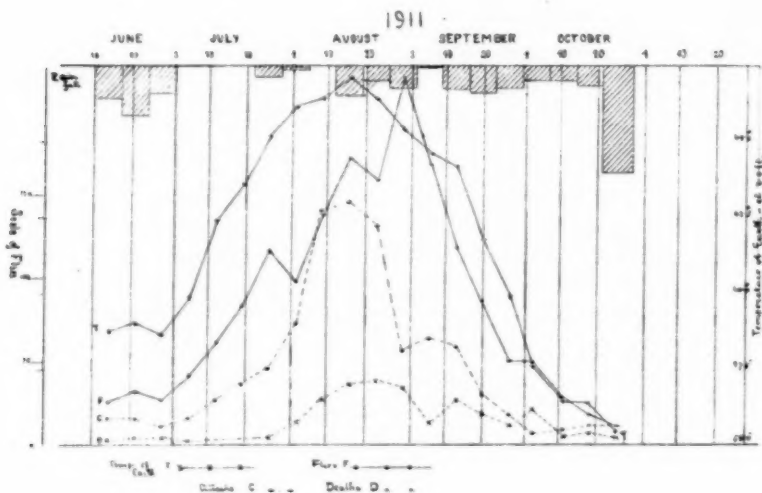


FIG. 7.

in the week with the highest earth temperature, the maximum number of deaths was in the following week. The maximum of the fly curve was a fortnight later than the maximum earth temperature.¹ There were two occasions on which the rising fly curve was checked by rainfall, although the mean earth temperature was rising, and the onset of wet weather in the first week of September, in conjunction with a falling earth temperature, produced a rapid diminution in the number of flies. The general agreement between the curves for flies, earth temperature, attacks and deaths is self-evident.

¹ That interval corresponds very closely with the time required for the hatching and metamorphosis of *Musca domestica*.

The curve for flies in fig. 7 is based on an average for all effective cemeteries. In fig. 6 a curve has been plotted (to the same scale) from the averages for effective cemeteries in houses which were not situated near any known accumulations of refuse (ordinary houses). The two curves differ in one respect, namely, that while in the earlier part of the season the all average fly curve (fig. 7) gives higher values, in the later part—commencing approximately with the wet weather, about September 10—the higher values are to be found on the “ordinary houses” curve (fig. 6). The latter figure shows the extent to which the concentration of attacks coincided with fly prevalence.

In addition to the counting of the actual numbers of flies, the women inspectors made notes (qualitative) as to the presence of flies in the homes of the reported cases of diarrhoea. These notes were not made in connexion with fatal cases not known before death. There is a difficulty connected with such notes, due to the possibility of varying standards being unconsciously adopted by the same inspector at different dates, as well as the differences between the normal standards of individual inspectors. I have, however, thought it worth while to attempt a classification of the 280 report cards containing notes as to the presence or absence of flies, arranging the notes under six heads:—

	Recovery cases						Fatal cases				
	June	July	Aug.	Sept.	Oct.	Nov.	June	July	Aug.	Sept.	Oct.
(I) “No flies present” ...	3	5	3	5	17	3	—	—	—	—	2
(II) “Flies present”—no statement as to numbers ...	—	2	4	3	—	—	—	—	1	—	—
(III) “Very few; hardly any” ...	—	2	6	1	—	—	1	2	4	1	—
(IV) “A few” ...	3	15	44	20	—	—	—	—	—	2	—
(V) “Many; considerable numbers” ...	2	3	35	10	—	—	—	—	3	3	—
(VI) “Large numbers; very large numbers” ...	—	1	49	19	—	—	—	—	10	—	—

In 53 out of the 135 instances included in Groups V and VI notes were made of circumstances favourable to the breeding flies, viz.: Proximity to refuse wharves, manure pits, &c., 21; defective dust receptacle, 29; fowls kept, 2; baker's shop next door, 1.

The result of such tentative analysis of the notes is concordant with the numerical count. In nearly half (135) the 313 houses visited came within the two highest groups (V and VI).

The correlation co-efficients for flies are, so far as I have been able to determine them, interesting, but, at their present stage, inconclusive. Co-efficients have been calculated for fly counts and

temperature (air and earth) and (average day) rainfall; also dates of attacks and deaths.

			Co-efficients			Probable error
Flies and air temperature	...	...	+ 0.06	...	...	± 0.09
.. earth	..	...	+ 0.88	...	...	± 0.03
.. rainfall	...	...	- 0.34	...	...	± 0.15
.. attacks	...	...	+ 0.75	...	...	± 0.06
.. deaths	..	...	+ 0.78	...	...	± 0.06

The first co-efficient (air temperature) is evidently valueless, but the others are, to say the least, suggestive. One observation should be made with regard to co-efficient for attacks which is, somewhat unexpectedly, lower than that for deaths. The explanation is, I think, to be found in the surmise made at the commencement of this paper, that the method by which the data were collected made it probable that a number of cases of diarrhœa, other than true "infantile diarrhœa," were included.

The co-efficients for flies and total rainfall and number of wet days are practically equal to that given above for average day rainfall, viz. :—

			Co-efficient			Probable error
Total weekly fall	...	...	- 0.31	...	...	± 0.14
Number of wet days per week	...	...	- 0.31	...	...	± 0.14

The chief problem in the epidemiology of summer diarrhœa is the explanation of the periodical—annual—epidemicity of an endemic disease. For something like three-fourths of the year diarrhœa appears to be incapable of becoming epidemic, although no week passes without deaths from this cause appearing in the London mortality tables. Occasionally, no doubt, limited outbreaks do occur in the colder weather, and an outbreak in February of last year which might pass for one of "epidemic diarrhœa" has been recorded in the *Journal of Hygiene* [11]. Nine cases in three families were observed, the *Bacillus dysenterix* (Flexner) being demonstrated as the cause of the illness.

A typical diarrhœa season is characterized meteorologically by high temperatures of air and earth and deficient rainfall. It is difficult to accept a higher infectivity of the *materies morbi* due to those facts as the sole explanation of the epidemic outburst. Some special agent appears to be required to produce a wide diffusion of infection. The house-fly seems to supply that want—to be almost too apt for the task—so that one fears to accept the "fly theory" as being too simple. Yet the experience in connexion with sleeping sickness and (as regards mosquitoes) ague affords some argument in favour of the theory.

Bearing in mind the evidence of the persistence of micro-organisms in the gut of the fly during its metamorphosis brought forward by Bacot [12],¹ and the filthy conditions in which such metamorphosis takes place, it does not demand a very lively imagination to connect the increased prevalence of diarrhoea with the summer breeding of flies. A perusal of Newstead's reports [14] cannot fail to lead to a conviction that flies are grossly contaminated at all stages of metamorphosis; moreover, the external structure of the imago is peculiarly adapted to convey infection. At the same time, however attractive the "fly theory" may be as a solution of the problem, it cannot be deemed to rest on a sure foundation until the causal micro-organism has been determined and traced through the fly.

It is customary to finish a communication such as this with some conclusions which the author thinks can be deduced from his inquiry. Personally I doubt whether what I have submitted does warrant any conclusions being drawn, as I feel that the examination of my material has been too incomplete. I will, however, hazard a summary of what the inquiry suggests, so that heads for discussion may be available.

(1) With all reserve it may, I think, be said that there is a connexion between the earth (4 ft.) temperature and the rise in prevalence of the disease, thus confirming Ballard's original observation.

(2) I wish to suggest that the connecting link between the earth temperature and diarrhoea prevalence is the fly, the accumulated heat which the earth temperature represents being favourable to the free hatching out of flies.

(3) The evidence I have adduced as to the frequency of multiple attacks in houses supports the view as to the relatively high infectivity of the disease.

(4) I suggest that it is desirable, with a view to elucidating the causation and methods of spread of infection, that extensive inquiries based on *cases* of the disease should be undertaken, and that some form of notification of the disease should be introduced.

¹ Ledingham has attempted to demonstrate the persistence of *Bacillus typhosus* in the intestines of pupæ reared in infected surroundings, but, "except under highly artificial surroundings," without success [13]. He refers to a successful experiment with *Bacillus anthracis*.

APPENDIX.

TABLE I.—RELAPSES.

Reference No.	Sex	Age	Date of onset (first)	Notes of cases	Termination of case
1	m.	1 year	? Sept. 7	Address given wrongly; reported again Oct. 4	R. Oct. 25
2	f.	5 months	Aug. 11	Apparent recovery Aug. 21; second attack Oct. 5	R. Oct. 12
3	f.	11 "	" 9	First attack not reported and known only by inquiry on second attack, Sept. 27	R. Oct. 12
4	f.	10 "	July 26	Date of recovery from first attack not recorded; reported again Aug. 21	R. Sept. 5
5	f.	10 "	Aug. 9	Made partial recovery only, relapsing Aug. 18	R. Sept. 8
6	m.	7 "	" 2	Reported recovered Aug. 11; second attack Sept. 11	R. Sept. 26
7	m.	1 year	July 25	Reported recovered Aug. 4; second attack Sept. 3	R. Sept. 11
8	f.	5 months	" 27	Reported recovered Aug. 2; second attack Aug. 11	D. Aug. 17
9	f.	1 year	Aug. 8	Made partial recovery; relapsed Aug. 21	R. Sept. 22
10	m.	5 months	July 10	Reported recovered July 25; second attack Aug. 2-10; third attack, Aug. 14	R. Aug. 23
11	f.	11 "	Aug. 10	Made partial recovery; relapsed Aug. 16	D. Aug. 23
12	m.	1 year	July 7	Date of recovery from first attack not recorded; second attack Aug. 12	R. Aug. 15
12A	f.	4 months	Aug. 7	Reported recovered Sept. 4; second attack Sept. 8 (infirmary Sept. 12)	D. Sept. 12
13	m.	5 "	" 31	Reported recovered Sept. 6; second attack Sept. 28—date of recovery not recorded	R. (?)
14	f.	2 years	" 9	Reported recovered Aug. 18; second attack Aug. 21	R. Aug. 30
15	m.	10 months	July 10	Made partial recovery; relapse July 28 to Aug. 8; second attack Aug. 21 (infirmary Aug. 24)	R. Sept. 11
16	m.	1 year	Sept. 5	Reported recovered Sept. 11; second attack Sept. 17	R. Sept. 25
17	f.	9 months	Aug. 7	Made partial recovery; relapsed Aug. 21	R. Aug. 24
18	m.	4 "	" 15	Reported recovered Aug. 21; second attack Aug. 25 (infirmary Aug. 28)	R. Sept. 11
19	m.	11 "	" 18	Attack acute from Aug. 21; reported recovered Aug. 30; second attack Sept. 28	R. (?)
20	f.	5 "	July 11	Reported recovered July 23; second attack Aug. 13	R. Aug. 23
21	f.	2 "	Aug. 10	Date of recovery from first attack not recorded; second attack Sept. 1	R. Sept. 6
22	m.	8 "	" 28	Reported recovered Sept. 15; second attack Sept. 22	D. Sept. 26
23	f.	11 "	" 20	Date of recovery from first attack not recorded; second attack Sept. 18	R. Oct. 2
24	m.	8 "	" 13	Reported recovered Aug. 18; relapsed Aug. 19	R. Aug. 23
25	m.	1 year	July 29	Made partial recovery; relapsed Aug. 7	R. Aug. 10

TABLE I.—RELAPSES (continued).

Reference No.	Sex	Age	Date of onset (first)	Notes of cases	Termination of case
26	f.	1 year	July 16	Reported recovered July 23; second attack Oct. 14	R. Nov. 13
27	f.	1 "	Aug. 15	Reported recovered Aug. 30; second attack Sept. 14	R. Sept. 28
28	m.	1 "	June 10	Made a partial recovery; relapsed July 15	R. June 28
29	f.	9 months	Aug. 24	Attack acute Aug. 27; reported recovered Sept. 1; second attack Oct. 5	R. Oct. 10
30	f.	1 year	Sept. 10	Reported recovered Sept. 18; second attack Sept. 22	R. Oct. 10
31	f.	9 months	Aug. 5	Made partial recovery; relapsed Aug. 18	D. Aug. 20
32	f.	1 year	July 12	Date of recovery not recorded; second attack Aug. 7-22; third attack Sept. 23	R. Sept. 26
33	m.	6 months	Aug. 11	Reported recovered Aug. 19; second attack Aug. 24	R. Sept. 5
34	m.	7 "	July 25	Reported recovered Aug. 23; second attack Sept. 5	R. Sept. 18
35	f.	5 "	Sept. 25	Date of recovery not recorded; second attack Oct. 14 (infirmary Oct. 17)	R. (?)
36	m.	6 "	July 23	Reported recovered Aug. 12; second attack Aug. 16-25	D. Nov. 11 (meningitis)
37	m.	10 "	Aug. 12	Made partial recovery; relapsed Sept. 16	R. Oct. 6
38	f.	8 "	Sept. 11	Acute symptoms Sept. 23; reported recovered Oct. 3; second attack Nov. 6	R. Nov. 23
39	f.	1 year	July 22	Reported recovered July 31; second attack Oct. 6	R. Oct. 24
39A	m.	7 months	Aug. 15	Reported recovered Aug. 21; second attack Aug. 28	D. Sept. 28
40A	f.	4 "	" 26	Reported recovered Aug. 31; second attack Sept. 9-25; third attack Oct. 15	D. Oct. 30
40	f.	5 "	" 21	Date of recovery not recorded; second attack Sept. 2	R. Sept. 17
41	f.	4 "	" 29	Reported recovered Aug. 31; second attack Sept. 9	R. Sept. 25
42	m.	2 "	" 21	Reported recovered Aug. 25; second attack Aug. 27	R. Sept. 5
43	f.	1 year	" 8	Reported recovered Aug. 10; second attack Aug. 23	R. Sept. 6
44	m.	10 months	July 18	Reported recovered July 24; second attack Sept. 12	R. Sept. 19
45	m.	9 "	" 7	Reported recovered Aug. 11; second attack Sept. 16	R. Oct. 14
46	f.	6 "	Aug. 15	Reported recovered Aug. 29; second attack Sept. 16	R. Sept. 22
46A	f.	6 "	" 15	Reported recovered Aug. 29; second attack Sept. 16	R. Sept. 22
47	f.	1 year	" 8	Reported recovered Aug. 10; second attack Aug. 21	R. Oct. 1
48	f.	1 "	June 13	Reported recovered June 26; second attack Aug. 7	R. Aug. 30
49	f.	5 months	Aug. 13	Reported recovered Aug. 30; second attack Sept. 12 (infirmary Sept. 21)	D. Oct. 9
50	m.	1 year	June 14	Reported recovered June 26; second attack Aug. 12	R. (?)
51	m.	9 months	July 17	Reported recovered Aug. 7; second attack Aug. 19	R. Aug. 30

TABLE II.—MULTIPLE ATTACKS.

Reference No.	PRIMARY CASE			Notes of associated cases
	Sex	Age	Onset	
1	f.	8 months	Aug. 20	Sister, aged 5 years, taken ill Aug. 27; both patients reported recovered Sept. 7
2	m.	5 "	" 27	Removed to infirmary Aug. 30; brother, aged 1 year, taken ill Aug. 30
3	E.C., f.	7 "	" 17	Bi., "baby," reported to have had diarrhœa <i>circa</i> Aug. 1; H. Bv., m., aged 1 year, taken ill Aug. 20
4	f.	5 "	" 19	Sister, aged 2+, had diarrhœa on Aug. 18 (to Aug. 29)
5	f.	8 "	" 21	Sister, aged 1 year, taken ill Aug. 26
6	f.	5 "	" 11	Twin sister taken ill Aug. 13 (died Aug. 19)
7	m.	1 year	" 25	Grandmother had diarrhœa at about same date
8	m.	1 "	" 15	Reported as recovered Aug. 17; sister attacked Sept. 14
9	E.H., m.	1 "	Sept. 4	Had been ill some days previously, acute symptoms on Sept. 4; L.C., f., aged 1 year, taken ill Sept. 4
10	V.C., f.	8 months	Aug. 4	I. L., f., aged 2 years, had diarrhœa from July 7-10
11	W.C., m.	5 "	July 10	Reported recovered July 25; second attack Aug. 2-10; W.G., m., aged 2+, had diarrhœa June 28 (to infirmary July 25); J.Cm., m., aged 1 year, taken ill July 25; reported recovered Aug. 4; second attack Sept. 3-11; his sister, aged 2 months, attacked Sept. 5
12	L.H., f.	5 "	" 27	Reported recovered Aug. 2; second attack Aug. 11 (to infirmary Aug. 14); F.M., f., aged 2 years, taken ill Aug. 15
13	f.	1 year	June 18	Reported recovered July 24; sister, aged 9 months, taken ill Aug. 14
14	G.S., m.	1 "	Aug. 12	Two children, aged 3 and 6 years, had diarrhœa for "one day" (date not recorded)
15	f.	10 months	Sept. 15	Three sisters, aged 7, 9 and 11 years, had diarrhœa previously (dates not recorded)
16	m.	6 "	July 30	Mother had diarrhœa July 27; sister, aged 8 years, August 4
17	m.	6 "	Sept. 21	Brother, aged 1 year, attacked Sept. 23
18	J.R., m.	1 year	Aug. 11	—H., "baby," had diarrhœa August 6-16; A. O., m., aged 1 year, taken ill August 18 (to infirmary Aug. 24); E. D., f., aged 1 year, taken ill Sept. 6
19	f.	11 months	" 10	Sister, aged 2 years, taken ill same day
20	W.G., m.	2 "	June 30	Reported recovered July 6; L.W., f., aged 2 months, taken ill Aug. 14; reported recovered Aug. 22; R.W.F., aged 1 year, taken ill Aug. 26
21	P.G., m.	1 year	July 7	[F.C., f., aged 3 months, died at infirmary of diarrhœa on Jan. 16, having been admitted from this house]; P.G. had a relapse or second attack Aug. 12; reported recovered Aug. 15; L.H., f., aged 1 year, had diarrhœa Aug. 2-18; L.D., f., aged 4 months, taken ill Aug. 7 (to infirmary Sept. 11, died there Sept. 12); E.B., f., aged 3 months, taken ill Sept. 10
22	M.C., f.	2 months	Aug. 12	Reported recovered Aug. 24; L.P., f., aged 2 months, taken ill Aug. 31; reported recovered Sept. 4; F.H., f., aged 6 months, taken ill Sept. 9
23	H.B., m.	1 year	July 13	Reported recovered June 15; E.S., f., aged 1 year, after having slight diarrhœa "for several weeks," was attacked severely Aug. 21, and died Aug. 25

TABLE II.—MULTIPLE ATTACKS—(continued).

Reference No.	PRIMARY CASE			Notes of associated cases
	Sex	Age	Onset	
24	P.L., m.	1 year	Aug. 17	Reported recovered Aug. 30; M.O., f., aged 2 years, had diarrhoea Aug. 9-18 and Aug. 21-30; E.P., f., had diarrhoea Aug. 21-25; F.J., m., aged 1 year, taken ill Sept. 26
25	W.S., m.	11 months	July 31	R.G., aged 2 years, taken ill July 29
26	J.H., m.	9 "	Aug. 10	Reported recovered Aug. 14; M.W., f., aged 7 months, taken ill Aug. 25
27	C.P., m.	3 "	June 25	Reported recovered July 5; G.C., male, aged 1 year, taken ill June 14; reported recovered July 6; H.S., m., aged 5 months, taken ill Oct. 9; a child (P. family), aged 2 years, had diarrhoea circa June 14.
28	E.G., f.	1 year	" 21	Reported recovered June 28; L.B., m., aged 8 months, taken ill Sept. 10
29	S.J., m.	1 "	Sept. 30	G.N., m., aged 2 years, had diarrhoea Aug. 25 to Sept. 6
30	V.W., f.	3 months	Aug. 17	[M.G., m., aged 7 months, living here, died of diarrhoea (at infirmary on April 21)]; W.G., m., aged 4 years, had diarrhoea June 5-27
31	m.	1 year	Sept. 5	Sister, aged 3 years, taken ill Sept. 7
32	W.B., m.	1 "	" 5	Reported recovered Sept. 11; second attack Sept. 17-25; father diarrhoea (one day) Sept. 17; C.M., f., aged 1 year, taken ill Sept. 8; M.S., f., aged 1 year, taken ill Sept. 4; G.S., m., aged 8 years, taken ill Sept. 6; J.S., m., aged 11 years, taken ill Sept. 5; A.S., f., aged 9 years, taken ill (to infirmary Sept. 7); an adult (L.P., m.) also had diarrhoea, date not recorded
33	M.W., f.	2 months	June 23	Reported recovered July 11; F.D., f., aged 1 year, taken ill Aug. 11
34	m.	1 year	Aug. 14	To infirmary Aug. 26; sister, aged 3 months, attacked Oct. 2 (died at infirmary Oct. 10)
35	P.H., m.	4 months	" 15	Reported recovered Aug. 21; second attack Aug. 25 (to infirmary Aug. 28); sister, aged 6 years, taken ill Aug. 31, recovered Sept. 2; brother, aged 10 years, attacked Aug. 31, recovered Sept. 13; R.W., f., aged 2 years, taken ill Sept. 13
36	m.	2 "	" 9	Died same day; twin sister had two attacks, Aug. 10 and Sept. 1
37	f.	8 "	Sept. 2	Sisters, aged 2 and 3 years, attacked the same day
38	A.W., f.	9 "	Aug. 10	G.L., m., aged 3 years, attacked August 16
39	m.	1 year	" 20	Sister, aged 7 years, had diarrhoea for a "few days," recovering on Aug. 22
40	M.Y., f.	9 months	" 24	Attack acute Aug. 27; reported recovered Sept. 1; E.Y., f., aged 4 years, had diarrhoea Aug. 22-29; W.C., f., aged 1 year, taken ill Sept. 10, partly recovered Sept. 18; relapsed Sept. 22; M.Y., second attack October 2
41	E.A., f.	1 year	" 15	Second attack Sept. 14-28; A.M., f., aged 7 months, taken ill Sept. 19
42	R.J., m.	1 "	June 22	Reported recovered June 28; J.M., m., aged 5 months, scalded Sept. 15; to S.M.H. Sept. 27, died there of diarrhoea Oct. 3
43	L.R., f.	9 months	Aug. 5	Relapse Aug. 18; died Aug. 20; twin brother, aged 9 months, attacked Aug. 18; recovered Aug. 31; K.H., f., aged 9 months, attacked Oct. 17. (K.H.'s mother had diarrhoea previous to that date)

TABLE II.—MULTIPLE ATTACKS—(continued).

Reference No.	PRIMARY CASE			Notes of associated cases
	Sex	Age	Onset	
44	W.H., m.	10 months	Aug. 5	R.I., m., aged 2 years, had diarrhœa Aug. 1-10
45	m.	1 year	Sept. 5	Twin brother had diarrhœa about Aug. 17
46	m.	1 "	" 9	Parents taken ill same day; history of diarrhœa in another family <i>circa</i> Sept. 1
47	m.	1 "	Aug. 17	Sister, aged 3 years, had just got over an attack on Aug. 22
48	F.Sc., m.	6 months	" 11	E.Sh., m., aged 1 year, taken ill Aug. 14
49	G.L., m.	1 month	July 31	Died Aug. 4; V.S., f., aged 4 months, taken ill Aug. 19
50	H.B., m.	1 year	" 18	Reported recovered Aug. 23 (removed Aug. 24); M.S., f., aged 8 months, taken ill Aug. 14; died Aug. 14
51	f.	1 "	Aug. 22	Acute symptoms Aug. 23; reported recovered Aug. 28; brother, aged 8 months, taken ill Sept. 1
52	M.T., f.	1 "	" 24	Reported recovered Aug. 28; E.B., m., aged 4 years, taken ill Sept. 6 (died Sept. 13 at infirmary).
53	m.	7 months	Sept. 1	Histories of diarrhœa: sister, aged 3 years, Aug. 20-27, and mother Aug. 27
54	f.	4 "	Aug. 26	Twin sister taken ill on same day
55	m.	2 "	" 21	History of diarrhœa in a brother and two sisters about Aug. 23.
56	m.	2 "	" 21	Second attack Aug. 27; mother taken ill Aug. 29
57	M.M., f.	10 "	" 23	Acute symptoms Aug. 25; E.P., f., aged 2 years, taken ill Aug. 29
58	f.	1 year	" 11	Sister, aged 1 month, taken ill Aug. 14
59	m.	1 "	Sept. 8	Brother, aged 6 months, taken ill Sept. 10
60	f.	6 months	Aug. 15	Twin sister taken ill same day
61	D.L., f.	8 "	" 19	Died Aug. 30; L.M., f., aged 1 year, ailing some days, acute symptoms Sept. 4
62	f.	6 "	" 8	Ill until Sept. 28; twin brother taken ill Sept. 10
63	f.	1 year	" 8	Brother, aged 7 months, taken ill Aug. 13
64	m.	1 "	" 7	Sister, aged 2 years, taken ill Aug. 10
65	m.	11 months	Sept. 6	Acute symptoms Sept. 14; history of diarrhœa in parents and a brother (aged 5 years) three to four weeks previously
66	m.	1 year	Aug. 5	(To infirmary Aug. 12); sister, aged 2 years, taken ill Aug. 27
67	m.	1 "	" 1	Infant, aged 5 weeks, taken ill same day; mother Aug. 18, and sister, aged 10 years, Sept. 1
68	M.Bu., f.	1 "	June 13	Reported recovered June 26; second attack Aug. 7-30; A.Bv., f., aged 7 months, Aug. 8-14
69	f.	1 "	Aug. 24	Ill until Sept. 15; elder brother had diarrhœa Aug. 23, father Aug. 28 or 29, and mother Sept. 11 or 12
70	G.C., m.	1 "	June 14	Reported recovered June 26; second attack Aug. 12; sister, aged 3 months, Aug. 11; S.C., m., aged 8 months, Sept. 12; died (infirmary) Sept. 28
71	G.F., m.	2 months	Aug. 16	— B., "baby," taken ill Aug. 17
72	A.O., f.	5 "	" 22	Reported recovered Sept. 12; E.B., f., aged 3 months, taken ill Oct. 6
73	f.	1 year	" 31	Reported recovered Sept. 8; mother taken ill Sept. 2
74	G.J., m.	3 weeks	" 2	To infirmary Aug. 10; M.C., f., acute attack Sept. 20, after some days' indefinite illness
75	m.	1 year	" 14	Sister, aged 3 years, taken ill Aug. 17
76	m.	5 months	Sept. 11	Died Sept. 13; sister, aged 2 years, taken ill Sept. 21

TABLE II.—MULTIPLE ATTACKS—(continued).

Reference No.	PRIMARY CASE			Notes of associated cases
	Sex	Age	Onset	
77	W.D., m.	9 months	Aug. 13	To infirmary Aug. 25; W.M., m., aged 4 months, admitted to infirmary Sept. 21, but date of onset uncertain
78	P.H., m.	3 "	Sept. 22	C.H., m., aged 10 years, attacked Aug. 31; reported recovered Sept. 13; R.W., f., aged 2 years, taken ill Sept. 13
79	G.R., f.	3 "	June 18	Reported recovered July 20; E.W., m., aged 3 years, taken ill Sept. 14
80	R.K., m.	1 year	?	To infirmary Aug. 3; E.L., f., aged 1 year, taken ill Aug. 17; I.K., f., aged 2 months, taken ill Aug. 25
81	f.	4 months	Sept. 7	Died Sept. 11; m., aged 4 years, taken ill Sept. 8
82	J.R., m.	9 "	Aug. 9	Reported recovered Aug. 23; W.D., f., aged 2 years, taken ill Aug. 23
83	f.	3 years	" 27	Sister, aged 10 years, said to have had diarrhoea, date not recorded
84	f.	2 "	Sept. 4	Brother, aged 10 years, had diarrhoea for one day, date not recorded.

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DISCUSSION.

The CHAIRMAN (Dr. E. W. Goodall) said it would be agreed that Dr. Dudfield's paper was a most interesting and comprehensive one, ranging from clinical details on the one hand to mathematical problems on the other. The subject was not one to which he had paid special attention, as he had never had to deal practically with epidemic diarrhœa on a large scale; but he had met with cases which suggested that the causes of acute fatal diarrhœa, whatever they were, were capable of giving rise to an acute febrile illness, without diarrhœa, but with marked prostration, and sometimes fatal, occurring in adults as well as children.

Mr. YULE said that a few of the correlations which Dr. Dudfield had worked out were strikingly high, such as that between infantile mortality and earth temperature, a correlation of 0·85, and the correlation between attacks and earth temperature of 0·68. The correlations 0·88 between flies and earth temperature and 0·78 between flies and deaths were also striking. It was comparatively rarely in such a problem that one was rewarded by finding such high correlations. The partial correlation between infantile mortality and earth temperature would be practically the same as the total correlation; the partial correlation between infantile mortality and rainfall on the other hand would become practically zero. Many interesting points arose bearing on the interpretation of those correlations. He hoped Mr. Bacot would speak of some of correlations with regard to flies. From what Dr. Dudfield said, he gathered that the diarrhœa faded away earlier than the flies did. If practically nothing were known about the bacillus causing infantile diarrhœa, he was on the same plane of ignorance on that point as people who were experts. He might therefore venture on a speculation and ask whether there was some seasonal prevalence of bacilli as apart from the prevalence of flies, and were flies merely carriers of bacilli? If there were a special season for bacilli, and the bacillus season were over before that of flies, and both were needed to account for the cases, the fading away of diarrhœa first might be accounted for, and then one might get a slightly higher correlation between the product of the earth temperature by the number of flies and the infantile mortality than between either of these factors alone and infantile mortality, because there would be no diarrhœa if there were no bacilli, and no diarrhœa if there were no flies.

Dr. STEVENSON said that while all no doubt had been much interested in this useful paper, he had been specially so, as a year or two ago he had attempted to cover some of the ground himself which Dr. Dudfield took up in his third part. He would refer to some of the results, of which, however, he feared the chief characteristics were their inconclusiveness. Before doing so, however, there were one or two points in regard to the tabulation in the first part of the paper to which he desired to draw attention. He wished to lay as little stress as possible on what he would say in regard to the tables, because Dr. Dudfield had met him more than half-way by reading the paper in a form

modified from the print. In Table I the gist of the matter would be more apparent if, instead of totals reconstructed and as published, the author had spoken of totals of mortality from diarrhoea and enteritis on the one hand, and from diarrhoea alone on the other. The diarrhoea and enteritis figures were taken from the Annual Report, as Dr. Dudfield pointed out, and the "published" figures were from the Annual Summary. But in one case the figures were corrected for deaths of non-residents, and not in the other. If the diarrhoea figures had been taken from the Annual Report they would have been more comparable with the diarrhoea and enteritis figures. And the change Dr. Dudfield spoke of in classification was from a restricted total for diarrhoea only, so-called, to a more comprehensive total for diarrhoea and enteritis. There was no fundamental change, as the separate items continued to appear. That applied also to the statement at the end of the second paragraph, mortality during 1911, where Dr. Dudfield desired a factor for adjusting the figures to the new age-period. The figures for the old as well as the new age-periods were given in Table IV of the Weekly Return. If it was objected those figures were not sufficiently final, the final figures would appear in due course in the Annual Report. With regard to the proposition for adjusting published records to the new table, the time was not yet ripe; all that could be done now was to adjust the new records to the old table, because the current records could be subdivided to any desired extent, whereas one could not go back and subdivide the old records. When the new had been current for a certain number of years, one would be able to see the average relationship of a heading under the new classification with its most nearly corresponding heading under the old, and it would be possible for anyone interested in the matter by this means to obtain continuity of records for limited areas. After these criticisms upon the first part of the paper, he now wished to refer to a striking agreement of some results which he had obtained with those which Dr. Dudfield gave for the correlation between infantile mortality with temperature and rainfall. The resemblance was so striking because although ostensibly different things were being correlated by the two workers, yet they had arrived at almost precisely the same correlation factors. A year or two ago he tried to examine the correlation of diarrhoea mortality records in London with the meteorological records. Working on diarrhoeal mortality at all ages, whereas Dr. Dudfield had taken infantile mortality from all causes, he calculated for almost the same period—1870 to 1909—correlation of mortality with earth temperature and rainfall from the same meteorological records as Dr. Dudfield used. The factor between diarrhoea at all ages and earth temperature in his figures was $+0.83$, as against Dr. Dudfield's $+0.85$ for infantile mortality, and with the same probable error. The correlation between diarrhoea and rainfall was exactly the same as stated by Dr. Dudfield for infantile mortality. Between earth temperature and rainfall, owing no doubt to his inclusion of one year less, he arrived at -0.38 as against Dr. Dudfield's -0.37 . He regarded the correspondence of these figures as evidence of the extent to which diarrhoea dominated the yearly fluctuation of infantile mortality.

As the author pointed out, there was a general downward trend in infantile mortality which was not altogether due to diminution of diarrhœa. But comparing a year of high with an adjacent year of low infantile mortality, it was probably diarrhœa in the main, which made the difference. The correspondence between the figures also showed that there was a parallelism between diarrhœa in infancy under one year of age and diarrhœa at all periods of life. Looking at the comparatively low correlation between diarrhœa and inches of rainfall, he worked out some correlations with other expressions of atmospheric moisture, and he found that the correlation between diarrhœa at all ages and number of days with rainfall was -0.52 , and between diarrhœa at all ages and average humidity -0.53 . Taking the correspondence of earth temperature with atmospheric moisture, as against a correlation of -0.38 between earth temperature and inches of rainfall, he found -0.68 between earth temperature and humidity, if the whole series of years were considered, or -0.87 for the years 1887-1909. For several reasons it seemed unsuitable to continue to use the more extended period of years, and he was driven to take the shorter period of only twenty-three years, although mathematicians would probably say it was an unduly short series to take for correlation purposes. One found that for the twenty-three years, dealing with infantile diarrhœa, which could not be carried back to 1870, and earth temperature, one obtained a correlation of $+0.78$, infantile diarrhœa and air temperature $+0.77$, rainfall -0.48 , rain days -0.63 , and humidity of atmosphere -0.79 . Repeating that series for diarrhœal diseases of infancy, which was much the same as was now called diarrhœa and enteritis, there were higher correlations even than for infantile diarrhœa alone, which was a very strong argument in favour of the change in tabulation, which would lay stress on the total diarrhœa mortality rather than on the mortality attributed to diarrhœa so-called.

In view of the close correlation of humidity and earth temperature, which was as high as -0.87 for the twenty-three years, the question arose as to which was the real and which might be a spurious correlation with diarrhœa. In order to elucidate this partial correlations were calculated. For the total period of forty years the partial correlation between diarrhœa at all ages and earth temperature, humidity being assumed constant, was $+0.76$. That was a justification of the prophesy which they had heard from Mr. Yule. The earth temperature correlation was scarcely affected, and humidity similarly treated gave practically no correlation at all, $+0.08$. Different results, however, were obtained in dealing with 1887 to 1909. A reason came out for that on examining the records of humidity. One found a great change had occurred. There was a difference in the method of recording humidity after the year 1886. Prior to that year most of the products of diarrhœa and humidity, deviations from the mean for the extended series, were positive, ten out of seventeen. After that period only four out of twenty-three were positive. Moreover, on running the eye over the two sets, it was evident that humidity ranged higher in the earlier years, and, as a matter of fact, there was a difference of 2 per cent. of saturation on the average. So the meteorological

data were open to suspicion for the earlier years. Dealing with 1887 onwards only, one got a partial correlation between diarrhoea at all ages and earth temperature of $+0.38$, and between diarrhoea at all ages and humidity of -0.38 ; humidity and temperature respectively being supposed constant. Infantile diarrhoeal diseases showed a partial correlation with earth temperature of $+0.24$, and with humidity of -0.46 . Thus there was here a score for humidity, whereas a little before, on a more extended set of data, humidity was not in it, and earth temperature was everything. At that point he was sorry to say he gave it up. With a view to the differentiation between moisture and temperature he tried to determine the best expression of moisture, but with no more successful results. Correlating infantile diarrhoeal diseases and days with rainfall, if one calculated a partial correlation which assumed constant humidity and earth temperature, the result for the years 1887-1909 was -0.30 , and the partial correlation of the same mortality with humidity which assumed a constant number of days with rainfall, and constant earth temperature was -0.21 . The influence of number of days with rainfall seemed from these results to be rather greater than the influence of humidity, which was contrary to the direction in which simple correlation work had pointed. Therefore his results could throw no definite light upon the question either. Still, he regarded the subject as one which was intrinsically suitable for treatment by the method of correlation, and he did not doubt that the work would be continued. Possibly the time was scarcely ripe yet for carrying out the correlation of records of mortality in a series of years with meteorological records, because there were not available sufficiently good series of meteorological records which carried one back far enough. He had tried the method for London, where the records would probably be more suitably than elsewhere, but even London failed him. He thought that possibly some work could be done on horizontal correlations, rather than vertical, i.e., comparing a number of different districts in the same year; or possibly a combination of methods might be used, and the yearly records might be divided up into weeks or fortnights, in order to get a larger series, even although a smaller number of years were used. He agreed with the conclusion that diarrhoea had behaved in 1911 as was to be expected: ten years ago, if there had been such a summer there would have been a far higher diarrhoea mortality.

Mr. MAJOR GREENWOOD, jun., said that with regard to correlations, Mr. Yule had great familiarity with partial correlations, having invented the most satisfactory notation for the subject, so that he was able to predict exactly what would happen. If one proceeded to take partial co-efficients from the total values given at p. 122, the results were that the correlation between infant mortality and earth temperature was not sensibly affected, the three partials being—

$$r_{01.2} = 0.83 \pm 0.03, r_{02.1} = 0.03 \pm 0.10, r_{12.0} = -0.23 \pm 0.10.$$

The only other point of interest in that connexion was that if one proceeded further and calculated regression co-efficients, one could form some idea of the

changes in any one variable when each of the others was altered from its mean value and these could be expressed in percentages intelligible to those unfamiliar with the notation of correlations. The result of that was that, supposing one changed the temperature one degree, on the average there would be a change of 28 deaths per 1,000 in the diarrhoeal mortality, whereas a change of 1 in., which was a considerable change in the rainfall, produced a change of less than one death per 1,000 in the diarrhoeal results. In a question of that kind this method was only valuable as giving expression to changes in percentages, which everyone understood. One could not say without further analysis that linear equations were really suitable for representing the variations in one of the variables associated with variations in the other, because this would only be a suitable method if the regression were effectively linear. It could not be *strictly* linear, because one could not have minus percentages. Another point which had already been dealt with by Mr. Yule and Dr. Stevenson, was the remarkably high values of these correlations, because many people had attempted to associate changes in disease-rates with changes in meteorological factors. For instance, five or six years ago Dr. H. D. Thompson and himself¹ worked on the subject of acute rheumatism. The method they used was very similar to Dr. Dudfield's, except that they avoided as far as possible the question of secular change. What they used as their measure of the prevalence of acute rheumatism was the percentage of cases of this disease admitted to the London Hospital in each month out of the total admissions to the Hospital. They got those data for thirty-one years, and then took each month separately—i.e., a series of thirty-one Augusts—and correlated them with the temperature, barometric pressure and rainfall. Very many co-efficients were calculated, but in actual fact the only meteorological factors which they found according to their method associated with rheumatism were the rainfall and the barometric pressure. In the series of Augusts, which seemed to be the best series, the correlation between rheumatism and rainfall was -0.47 , and between rheumatism and barometric pressure $+0.36$; the correlation with air temperature was negligible. That was an illustration of the correlation in regard to rheumatism, which had been thought to be associated with meteorological conditions, and was notably less striking than Dr. Dudfield's figures. The other point was that Dr. Dudfield was going to evaluate the partial co-efficients in the other cases, and he (the speaker) thought that the tempting figures to take would be the four variables: flies, earth temperature, rainfall, and attacks; then one might determine the partial co-efficients from them. Very likely that was the method which Dr. Dudfield proposed to follow. If more variables were taken than four, very good data were required to justify one for the large amount of arithmetical labour imposed. Four were manageable. Those were the points which struck him from the statistical standpoint. Perhaps Mr. Bacot or some experimental worker would be able to throw some light on the interpretation of those correlations. He desired to conclude by expressing his hearty congratulations to the author upon the valuable work done.

¹ *Journ. of Hyg., Camb.*, 1907, vii., p. 171.

Dr. SIDNEY DAVIES said that the author seemed to have given strong additional evidence for believing in theories which probably most of them already believed in: the association of diarrhœa with earth temperature, the part played by flies, &c. But he did not seem to have brought out strongly that a considerable prolongation of earth temperature of moderate extent had a similar effect to a short period of higher temperature. In 1910, when there was a low summer temperature there was still much diarrhœa in October; whereas last year the diarrhœa was quite exhausted in October. Dr. Dudfield did not say much about the manner in which temperature acted, but he (the speaker) believed it had a very large effect in reducing the resistance of the body, as well as helping the activity of the germ or the flies, or whatever was causally connected with it. People were much more susceptible to many forms of illness in hot weather. When he was in Egypt he noticed that children died to a large extent in the height of the summer from bronchitis as well as from diarrhœa, more so than in the winter. He had already observed that the rainfall did not seem to have much connexion with the amount of diarrhœa. One slight error which the author fell into consisted in saying that no explanation had been given of the diarrhœa curve coming to an end before the fly curve ended. Surely there were two explanations; one, that the disease had partly worked itself out, but another was, as pointed out by Dr. Peters, that it was not simply the number of flies but their activity, for towards the end of the summer flies became comparatively dormant. Dr. Dudfield seemed to cast a slight aspersion on Woolwich in regard to the use of long-tube feeding bottles for children. But he would remind the author that the Woolwich figures began earlier than those for Paddington, and that the long-tube bottles had been steadily diminishing; the lady inspectors at Woolwich had not been less active than those in other parts. Dr. Dudfield certainly got over the main difficulty very easily, namely, the question "What is Diarrhœa?" The change of classification, for which Dr. Stevenson was largely responsible, was one indication of it. He felt some hesitation in spending much more labour in getting together diarrhœa statistics until one knew more definitely what it was, until bacteriologists came to their assistance, and definite means of diagnosing the disease were established. But he agreed in the plea for notification, not from the statistical point of view, but from the standpoint of prevention. In the seven years since the date of commencing voluntary notification Woolwich had kept down its diarrhœa mortality considerably below that for London, whereas in the previous four years its rate was slightly above the London death-rate.

Dr. BUTLER said it was refreshing to get a paper upon an epidemic disease which was still in the pre-bacteriological age. The author turned his back upon all differentiation of diarrhœa, and said there was a symptom group which might be taken as a disease and subjected to mathematical analysis. Many of the speakers had pointed out that this did not lead one very far. Metaphysics had been defined as the finding of bad reasons for what we believe on instinct; and it would seem as if the method employed by

Dr. Dudfield was the finding of complicated mathematical formulæ for that which was common knowledge. All the members of the Section were prepared for the conclusions which Dr. Dudfield had arrived at. They knew that diarrhœa was a disease which killed infants who were not breast-fed; that they died chiefly in very hot and dry weather, and that the disease was rife in the autumn and associated with an earth temperature the critical limit of which had been very definitely established. Beyond that, our knowledge of this disease had not been materially advanced by the application of the mathematical methods which Dr. Dudfield had used. He felt considerably relieved at the explanation which Dr. Davies had given of the diminution of the use of long-tube bottles in cases of diarrhœa deaths ascertained in Woolwich and Paddington, because in 1905 he investigated zymotic diarrhœa on the same lines, and the percentage of long-tube bottles in cases of death from that disease in Willesden was 25. As this inquiry was conducted at an earlier date than the others, it lent support to the explanation that the diminished use of long-tube bottles was due to education. That diarrhœa was diminishing beyond what could be accounted for by meteorological conditions was probably to be explained by facts of that kind. People were better instructed and were exercising more care and more intelligence in infants' nurture. Probably one would find a smaller percentage of undesirable practices such as the use of long-tube bottles in cases which died now than five years ago.

Dr. SANDILANDS desired to call attention to the conclusion set forth on the last page of the paper, in which the author put forward the opinion that the case histories showed that diarrhœa attained a high degree of infectivity. He (the speaker) wished to point out that the only evidence of this adduced in the paper was the occurrence of multiple cases, either in families, in tenements, or in houses. In investigating the question of infectivity, it was of primary importance to lay down what kind of evidence was acceptable as proof of case-to-case infection. He would like to read the sort of evidence which appealed to Murchison as conclusive on that point in the case of typhoid fever. In regard to the question whether typhoid was infectious, he said: "Many instances might be cited where nurses who have gone to attend on patients suffering from enteric fever at their own homes have been attacked shortly after their arrival. But on the supposition that the disease may have a local origin, the nurse is exposed to the poison equally with the residents, and, in fact, the recent date of her exposure renders her even more liable. I have never known or heard of a case where fever has been communicated to the medical attendant not residing in the house, and Piedvache makes a similar statement. It is therefore necessary to search for evidence derived from what occurs when patients are treated in different localities from those in which they contracted the disease." Then Murchison was unfortunate enough to add, "Hospital experience lends little support to the doctrine of contagion." The fact that Murchison happened to have been wrong in regard to the non-contagious properties of typhoid fever did not detract from the value of his conclusion that the essential test in determining whether any given disease was

infectious or not was its behaviour when it was taken from its environment and transported into an institution where there were many inmates who were either healthy or suffering from other complaints. One of the most remarkable features about diarrhoea was its attachment to particular localities. That being so, if one investigated the disease in the locality in which it occurred year after year, one would naturally expect to find multiple cases arising in the houses where those investigations were made. That was the natural history of malaria, which was a local disease, and it was the history which had always been found in any plague epidemic. Therefore he could not see how any support to a theory of the infectious nature of diarrhoea could be provided by piling up figures which dealt solely with the occurrence of multiple cases in houses. Such figures supported the theory of local origin to the same extent as they supported the theory of case-to-case infection. The point could only be settled in hospitals, and in hospitals bubonic plague had been conclusively proved to be incapable of being conveyed from case to case. This fact was impressed upon his mind because in the plague hospital which he had been in charge of in India, the contacts were taken from infected houses into the hospital, where they tended their stricken relatives in the huts reserved for plague patients: and yet out of more than 100 contacts not one developed plague. The converse had been proved in the case of typhoid fever by hospital experience, in the case of puerperal fever and many other infectious diseases. The investigation which he himself had made, and which was concerned with all the children's hospitals in England which he could find in the Directory, was entirely inconclusive on that point. He had not the figures that night, but he had read the evidence and seen the letters which members of the Section had not seen, and in the wording of the letters and the general nature of the evidence which was offered he found nothing which convinced him that any substantial case had been made out in favour of the suggestion that diarrhoea had ever been known to spread from case to case in hospital. He did not suggest that such evidence would not be forthcoming, but he thought it was an extremely valuable line of inquiry, and he was sorry that his own investigation was not extended so as to include infirmaries. At the same time, until evidence of that kind was forthcoming, members of the Section would do well to refrain from arriving at a conclusion on the results of inquiries which had been confined to the area in which the diarrhoea had occurred.

Mr. BACOT said his work in connexion with *Musca domestica* had been but slight. One could not, however, come closely into contact with the insect and rear it through a number of generations without coming to some conclusions. His own ideas might be of use, but they should not be taken as possessing too great weight. The fly certainly hibernated in the adult stage, and it was said also to hibernate in the puparium. But the numbers which went through the winter must be few. Probably the death-rate was high on account of the attacks of spiders, birds, and predacious insects, and the difficulty was for it to get a start in the spring. The kind of rubbish heaps of which photographs had been shown would not afford much chance of a temperature high enough for

Musca domestica to breed freely; to get its effective start it must seek fermenting rubbish such as manure. Probably the great increase of *Musca domestica* towards autumn was owing to the fact that these large accumulations of what was called dry rubbish, but which contained enough moist spots to enable the larvæ of *Musca domestica* to thrive, became available when the ground temperature was at its maximum. Earlier in the season the periodical removal of the rubbish would be apt to take place ere the life-cycle could be completed, but when the conditions became favourable it was possible for the fly to develop in fourteen days; if the rubbish were carted at shorter intervals during hot weather this chance would be spoiled. Humidity of the atmosphere must be favourable to the breeding of a species like *Musca domestica*, but wet days or cool weather would check the flies spreading. They would remain in the proximity of the heaps until warm or sunny days rendered them active. The incidence of flies in houses would be affected partly by warm days and cool nights; as their hibernating instinct would be fostered by the coolness of the evenings and they would seek out the warmth and shelter afforded by houses. The fact that flies were noticeable while the disease was dying down would be due to their growing sluggishness in the absence of warm, sunny days; in cool weather they would not move from one room or house to another.

Dr. HAMER remarked, with reference to correlation, that Dr. Dudfield had not only said he did not regard correlation and causation as identical—they did not always get as far as that—but that he had actually gone further and said he thought the very close correspondence between the fly curve and the diarrhœa curve might perhaps be held to tell against there being a cause and effect relationship. He (Dr. Hamer) cordially agreed with that, and considered that one great difficulty as regarded acceptance of the fly as causal agent was that the correlation co-efficient was so high. Mr. Yule had dealt with the same point, though in a somewhat different way, when he referred to the possible necessity of taking a product of two things, the prevalence of bacilli and the number of flies, and correlating that compounded factor with the diarrhœa curve, rather than taking the flies by themselves. It was the very closeness of correspondence between the fly curve and the diarrhœa curve which might conceivably be regarded as fatal to the fly hypothesis. Dr. Davies said that exhaustion of susceptible material met the difficulty of the two curves falling together, or, indeed, the fact that the diarrhœa curve usually fell before the other. The explanation was originally suggested by Dr. Niven, but it must be abandoned in face of the fact that the phenomenon occurred both in light and heavy diarrhœa years. Dr. Davies, again, appealed to the question of the immobilization of flies. He (Dr. Hamer) had studied that matter during the last two years and was satisfied that there were grave difficulties with regard to accepting the explanation. Flies were mobile enough in late September or early October, when there was steady diminution in the amount of diarrhœa, and such observations as he had been able to make with regard to the fly fungus convinced him that the fungus theory was very unsatisfactory from the point of view of affording an explanation. With regard

to the time of rise of the fly and diarrhoea curves there was a greater difficulty still, because one was placed on the horns of a dilemma; one had either to abandon the infectivity of diarrhoea, or, in the alternative, one had to explain how the average length of interval between multiple cases in houses could be reconciled with the sudden uprush of the fly curve. Dr. Niven, when he contributed his paper to the Section, gave particulars as to multiple cases, and they worked out in the following way: he had 34 cases in which the possible period of infection was under seven days, 20 in which it was between seven and fourteen days, and 11 in which it was longer than fourteen days. That, on an infectivity hypothesis, gave an average period for the conveyance of infection of about ten days. In Dr. Dudfield's series, which was a most extensive one, the average period for infection was still longer—viz., about twelve days. How could these average periods be reconciled with the fact that the diarrhoea and fly curves practically rose together? Sometimes the diarrhoea curve was, it was true, a day or two days behind the fly curve; sometimes, on the other hand, it was actually a day or two in front of it. It seemed to him that the facts could not be fitted to the theory. He wished Dr. Dudfield had told the meeting more about the area near the barges of refuse in the Paddington basin in which he had noted the spreading out of the diarrhoea in relation to time. The diarrhoea was not limited to the fly period, as in the other areas. It would have been very interesting to have further been able to compare the incidence of diarrhoea per unit of population in this area showing excessive numbers of flies, with its incidence on other areas where there were not such huge accumulations of refuse, and, presumably, not so many flies. In his own report, which had been referred to, he did not refer to the plum and pear curves as evidence that plums and pears caused diarrhoea, but rather as showing that there was as close relation between the curves for plums and pears and diarrhoea as there was between the curves for flies and diarrhoea. Why then, his contention ran, should causal relationship be pre-supposed for flies and not also for plums and pears? If correlation proved causation in the one case why not in the other also?

Dr. J. T. C. NASH wrote as follows: I regret that since I read Karl Pearson's "Grammar of Science" some eight or ten years ago, I have not indulged much in calculating correlation co-efficients; for although unquestionably they tend to render statistics more precise I have not been able to satisfy myself that the slightly increased reliability of the calculations is sufficient repayment for the time and mental labour involved, the figures on which they are based being generally too few in number and otherwise so defective in minor directions as not to be worth the trouble involved; as illustrated by Dr. Dudfield himself when he says "that the method by which the data were collected made it probable that a number of cases of diarrhoea other than true infantile diarrhoea were included" in his figures. The facts and figures adduced by Dr. Dudfield are certainly valuable, especially in conjunction with those previously brought forward by Peters and Sandilands. It may, however, be of advantage to refer back to a discussion on the causation

of epidemic diarrhœa following on a valuable paper by Professor Délépine on "The Bearing of Outbreaks of Food Poisoning upon the *Ætiology* of Summer Diarrhœa." Professor Délépine's general conclusions¹ were that the chief cause of epidemic diarrhœa was faecal contamination of milk at the farm or in transit, time and temperature being most important factors in the multiplication of bacteria and consequently in the degree of infectivity of milk. In the discussion which followed, Newsholme illustrated the fallaciousness of Ballard's critical point of 56° F., based on his experience in Brighton in 1902, corroborated by the figures for Croydon (Meredith Richards) and Southend-on-Sea (J. T. C. Nash) for the same year.

Newsholme and Richards pointed out that too many of the fatal cases of diarrhœa occurred among children artificially fed on condensed milk to justify Professor Délépine's conclusion as to the chief cause of diarrhœa, while J. T. C. Nash held that there was no one specific bacterium of diarrhœa, and further, that Ballard's conclusions that "the essential cause of diarrhœa resides in the superficial layer of the earth, its vital manifestations depending upon conditions of season, &c.," would still hold good were the mere comprehensive term "organism" substituted for the word micro-organism in Dr. Ballard's original definition. He suggested further that this organism was the common house-fly, and referred to bacteriological investigations by Foulerton which showed that flies taken from refuse heaps carry about many dangerous intestinal and putrefactive bacteria. The house-fly, as the organism connecting earth temperature and diarrhœa, explains the pollution of condensed milk equally with that of cow's milk, and the most remarkable evidence brought forward was that flies were conspicuous by their absence in Southend-on-Sea in July and August, 1902, and coincidentally there was not recorded one single death from diarrhœa in these months. In September, 1902, however, flies made their appearance and thirteen infantile deaths from diarrhœa were recorded in the space of three weeks. At the end of September both flies and diarrhœa again disappeared.

In view of the above I am interested to note that Dr. Dudfield also suggests that a connecting link between the earth temperature and diarrhœa prevalence is the fly, and I venture to draw the attention of those interested in this subject to a paper on "The Prevention of Summer Diarrhœa" which I contributed to the *Practitioner* in May, 1906, and finally, I may be permitted to repeat what I said in a paper on "The *Ætiology* of Typhoid Fever,"² viz., that epidemic diarrhœa is largely a local disease in each sanitary district confined almost wholly to well-defined limits in each sanitary area. Other large areas under the same sanitary authority may escape altogether, or suffer but slightly, certainly not in an epidemic sense, contemporaneously with other areas severely affected. This patchy distribution clearly indicates that season and temperature, apart from other factors, are not the essential cause of epidemic diarrhœa, and the same argument applies to condensed milk and

¹ *Trans. Epidem. Soc.*, 1902-1903, xxii, pp. 11-33.

² *Practitioner*, 1906, lxxvii, pp. 793-801.

other infants' foods used in poor class homes. It is also applicable to milk supplies in general, or to a combination of all these factors. But I do attribute this patchy distribution of epidemic diarrhoea to the relative amounts of organic refuse found in each area and in a minor degree in each house, because collections of organic refuse attract flies and are largely utilized by flies for breeding purposes in the fly season. When germs such as *Bacillus coli*, *Bacillus enteritidis* (Gaertner), and other putrefactive bacteria, as shown by Foulerton years ago, to be present in a fly taken from a refuse heap, are introduced into condensed milk, or other milk, or sugar, by flies—in great numerical abundance—the only wonder to my mind would be that flies should ever be proved to be not a prominent factor in the spread of epidemic diarrhoea. Apart from pollution by flies it is difficult to see why condensed milk should be the sole or chief food of so many victims to diarrhoea—the same kind and quality of condensed milk being consumed with impunity in a neighbouring district at the same time, the only appreciable difference in the two districts being the relative proportion of organic refuse, and the relative prevalence of flies.

Dr. DUDFIELD, in reply, stated that to him the preparation of the last section of his paper had been the most interesting. He was unable to agree with Dr. Butler that it was waste of time to confirm or refute popular impressions by a logical test such as the mathematical. He feared that his suggestion that factors were wanted to adjust the old diarrhoea rates to the new classification had not been completely understood. The data promised by the Registrar-General would suffice for converting the new classification to the old for districts with reference to which the data may be supplied. There would, however, always be a large number of areas for which such data would not be available. The diarrhoea statistics for those areas prior and subsequent to 1911 would be based on very different classifications, and there would be no connecting link between the two series of statistics. Dr. Stevenson had suggested that some years hence the new statistics would furnish factors such as had been suggested, but had he (the speaker) waited for the realization of that possibility his communication would not have been submitted that evening. He had been much interested to learn that Dr. Stevenson had obtained total correlation co-efficients agreeing so closely with his (the speaker's) own, but was disappointed to learn that the partial co-efficients had proved so inconclusive. He proposed, nevertheless, to continue his work with the data submitted that evening.

Dr. Sandilands had expressed the view that the evidence adduced in the paper was insufficient to demonstrate the infectivity—not necessarily the "high infectivity"—of diarrhoea, and had stated that he required evidence of the spread of the disorder in hospitals. In the first place he (the speaker) had not relied solely on the data in his communication, but he thought that such evidence, taken in conjunction with that brought forward by other authors (not excluding Dr. Sandilands himself) did confirm the opinion that diarrhoea was an infectious disorder. He thought that the demand for evidence of spread

in hospitals was hardly pertinent. In such institutions every care was supposed to be taken to prevent the spread of infection, and if any spread did occur, it would be reasonable to assume that there had been some breach of the prescribed regulations. It would be within the recollection of the older members present that cases of diphtheria—and especially tracheotomy cases—used to be treated in the ordinary wards of general hospitals. The occurrence of secondary attacks among the other patients in the ward was a most unusual event, yet no one would dispute the infectious character of that disease. He could not, therefore, agree with the view that the absence of spread of diarrhoea in hospitals was any evidence against the infectivity of that disease. To a certain degree, what Dr. Sandilands had told them of his experience in plague hospitals was in favour of the view propounded by him (the speaker), and more so if the fly theory of diarrhoea spread be accepted.

Dr. Hamer appeared to think that because there was so close an agreement between the curves of fly counts and diarrhoea, the fly theory ought not to be accepted. His (the speaker's) right to pose as a mathematician had been (amusingly) questioned that evening, but in spite of that he would venture to say that no mathematician would be prepared to endorse that view. At the same time it would be useless to deny that there were many points connected with the fly theory which required to be elucidated. The most difficult to explain were the almost simultaneous rise in numbers of flies and attacks and the fact that the fall in diarrhoea prevalence usually preceded the diminution in prevalence of flies. Occasionally, however, the fading away of the fly curve preceded that of the diarrhoea curve, as he had observed in 1910. He recognized that a dogmatic assertion of the sufficiency of the fly theory to explain the annual epidemicity of diarrhoea was not at present justified by the evidence available, although he personally inclined to the view that ultimately that view would be accepted. Just as the discovery first of the micro-organisms of ague and sleeping sickness, and subsequently of the insects serving as carriers of those micro-organisms, had served to clear up the mystery attaching to the spread of those diseases, so he thought that the discovery of the micro-organism of diarrhoea and the tracing of it through flies would elucidate the problem of the latter disease. He had drawn attention to the difference in prevalence of diarrhoea in 1899 and 1911—two years presenting almost identical meteorological characteristics, with, however, a slight difference (in the rainfall) in favour of a higher prevalence during the latter year—and the markedly lower diarrhoea mortality in the latter year. One economic change distinguished the two years—viz., the substitution of mechanical for horse traction. There had been in consequence a very great reduction in the amount of manure produced within the metropolis, and he ventured to submit for consideration the possibility that the lessened facilities for the breeding and pollution of flies had been one of the factors in producing the lower mortality recorded last year.

Before concluding, he desired to thank Dr. Stevenson and the officials of the General Register Office for the information which had been furnished to him and also the members of the staff of his department for their help in preparing the drawings included in the paper.

Epidemiological Section.

March 22, 1912.

Dr. THEODORE THOMSON, C.M.G., President of the Section, in
the Chair.

Presentation of the Jenner Medal.

THE PRESIDENT announced that, acting upon the decision of the Council of the Section that the Jenner Medal, "for work of great merit," should be conferred upon

SIR PATRICK MANSON, K.C.M.G., F.R.S.,

he had waited, accompanied by the two Honorary Secretaries, upon Sir Patrick Manson, at 50, Welbeck Street, and had presented to him the Jenner Medal.

The Jenner Memorial Medal was founded in 1896 on the occasion of the Jenner Centenary Celebration.

Sir Patrick Manson is the third Jenner Medallist, the two former recipients being Sir William Power, K.C.B., F.R.S., and Professor A. Laveran.

The Relation of Housing to the Isolation of Scarlet Fever and to Return Cases.

By MILES B. ARNOLD, M.D.

IN this paper I propose to show the effect, upon the spread of infection of scarlet fever, of isolation in hospital as compared with isolation at home. The survey is confined to 3,000 consecutive cases reported in Manchester in 1907 and the early part of 1908, the subsequent cases occurring in connexion with them having been traced through the three months following the notification of the three-thousandth case. I wish to take this opportunity of cordially thanking Dr. Niven for so kindly allowing me to use the Manchester records. Many of the methods of classification used will be found in his Annual Reports.

Whatever view one may take as to the value of institutional methods in general as compared with management of home affairs by the family concerned, it is obvious that there are certain advantages in the hospital treatment of infectious diseases. On the general question I shall touch only briefly and on the most prominent points:—

(1) If a source of infection is discovered and removed to hospital there is obviously less chance of its spreading immediately to the family than if the source of infection is left in the isolation which may be arranged in the home.

(2) The social and business relationships of the family concerned are rendered easier and safer if the member suffering from an infectious disease has been removed.

(3) In severe cases at any rate it is quite impossible for sufficient attention to be provided in the average home.

On the other side two main criticisms have been made. The first is the suggestion that a patient in an isolation hospital is subjected to the risk of contracting a severer form of the disease for which he was admitted and may occasionally contract some other disease in addition. Certainly it occasionally happens that measles or chicken-pox breaks out in a ward, but, excepting that the resistance of the inmates is probably somewhat lowered by the primary disease, this is a risk which is shared to a considerable extent by children's general hospitals, by crèches, and by schools. As to the increase in the severity of any one disease through collecting patients together opinion is still divided.

I do not consider that with modern methods of nursing this may be seriously considered as an overwhelming objection to isolation hospitals. Comparisons of the death-rates in and out of hospitals are not of much value, as there is undoubtedly a tendency to send into the hospital cases which are severe and to attempt to nurse at home those which seem to promise a mild course. Even then an unexpected attack of nephritis or the occurrence of a mastoid abscess not infrequently leads to the admission of a patient to hospital late in the disease. In any case very low death-rates are often recorded by large hospitals, so that the suggested increase in severity cannot be a constant factor of serious extent.

The second main objection raised to hospital isolation is that patients when discharged have a power, to an extent not found in those isolated at home, of infecting susceptible persons. It has even been suggested that this infectivity is so great as to balance any known gain from hospital treatment. This is the main criticism which believers in isolation hospitals have to answer. The old answer that infection of susceptible persons, following on the return home of a patient from hospital, was due either to coincidence or to a disinterring of articles which had escaped disinfection must be abandoned. The investigations of Dr. Newsholme, Dr. Niven, Dr. Chalmers and Dr. Killick Millard, and last but not least the reports of Dr. Turner and Dr. Cameron to the Metropolitan Asylums Board, are conclusive as to the infective power of some patients on discharge from hospital.

Another explanation offered is that the protracted or recrudescient infectivity is due to discharged patients catching cold on the way home. Though precautions against this should clearly be taken, this reply proves too much when we remember that we are working in a country in which discharging in inclement weather is almost unavoidable.

Before coming to the details of the analysis of figures bearing on this question, I shall have to give rather a tedious explanation of the definitions to which I have conformed. In the first place, it should be explained that though 3,000 consecutive notifications were dealt with, only 2,192 remain in the following tables. The analysis is mainly concerned with any relationship which may be found between the density of the population in the homes and the success of the isolation of a patient suffering from scarlet fever either in the home or in hospital. It is unnecessary to detail the various reasons for which notifications had to be ignored, as a few examples will suffice. Obviously "overlooked cases" are not to be included when the efficiency of isolation is being considered, and these have been dealt with in another paper. All cases

occurring in institutions had to be ignored as the density of the home population could not be accurately estimated. Then, again, as an enumeration of the susceptible persons remaining in the home is included, any sheet in which this information was incomplete had to be disregarded. Deaths also had to be taken out. These examples will suffice. The following definitions were adopted:—

Primary invasions of a household include the first case and all subsequent cases which occurred within seven days of the isolation, either at home or in hospital, of the primary or subsequent cases. In this respect the figures are a better guide to the truth than many of those published. It is obvious that a case occurring four or five days after another in the same house proves nothing as to the advantage of the particular form of isolation adopted. It is generally agreed that hospital cases are drawn from the more populous homes. The chance of a subsequent case occurring by direct infection in such homes is obviously greater, especially as the parents in these homes are often less careful in observing the onset of disease. For this reason I have adopted the definitions of a "primary invasion" as including all cases in which, the interval being less than seven days from known exposure, the infection could not be safely attributed to other causes.

Susceptible persons are all living as members of the family who are said not to have had scarlet fever and who are under 16 years of age. Any others who actually contracted the disease are also included.

The density of home population is the number of inhabitants per room. Children of all ages are included as inhabitants.

Incidental infections are infections of susceptible persons occurring during the period between seven days after the beginning of isolation of the invading cases and before the release from isolation of any of the patients.

Return and recovery cases are any occurring amongst the susceptibles after the release from isolation of a previous case. There is no time limit except that the search for subsequent cases was not carried further than three months after the date of notification of the three-thousandth case. On the other hand, only infections occurring in the home of the patient are counted, such a history as having "played in the street with a child recently suffering from scarlet fever" is ignored.

It seems very important not to have a small time limit in considering return cases. If the question under investigation is that of protracted or recrudescence infection it is surely begging the question to refuse to include any case occurring after three weeks or a month.

Dr. Niven has always refused to accept a time limit, with the result that his reports are a mine of valuable information on this point. There are numerous other minor points as to the methods used in constructing the tables in this paper, which it would be tedious to relate. It should be mentioned that although the figures appear here only as totals, I have grouped them also for my own satisfaction in three consecutive thousands and the important percentages did not vary greatly.

It is of course generally recognized that patients treated in isolation hospitals are not drawn from the same class socially as those treated at home. Dr. Niven has shown that the rentals of the houses in which patients suffering from scarlet fever were kept at home in Manchester were considerably higher on the average than the rentals of those houses from which patients were removed to hospital. Again, in Dr. Turner's report it was demonstrated that whilst no relationship could be established between the incidence of return cases and the particular hospitals of the Metropolitan Asylums Boards in which the patients had been, there was a definite relationship between the incidence of return cases and the borough from which the patients had come. This suggests at once that some at least of the factors producing return cases are to be found in the home.

The figures show the following facts:—

- (1) The numbers isolated at home and in hospital.
- (2) The numbers of susceptible persons remaining in the homes in two groups.
- (3) The number of persons per room in the houses concerned; the grouping being: (a) less than 0·5 person per room, (b) 0·5 but less than 1 person per room, (c) 1 but less than 1·5 persons per room, (d) 1·5 but less than 2 persons per room, (e) 2 or more persons per room.
- (4) The number of incidental cases occurring.
- (5) The number of cases which occurred after the release from isolation of an invading case, either from hospital, i.e., return cases, or from home, i.e., recovery cases.

Before giving the details, the fact should be emphasized that they are of no use except for the purpose in view. For instance, of the 2,192 cases with which I am dealing, only 57 per cent. were removed to hospital. This is not the percentage removed in Manchester. The actual percentage is greater and the difference is caused by several eliminations, such as cases from institutions, &c., which affect chiefly the hospital cases. Again, the return case-rate is very high. It is always a higher figure in Manchester than in most towns, because no time

limit is fixed and all cases are included. But in this instance the figure is much higher than the truth, the reason being that return cases are always specially investigated and therefore all sheets relating to them were filled in perfectly. On the other hand, a number of sheets where there had been no return case had to be left uncounted because of some ambiguity of statement.

Two thousand one hundred and ninety-two invading cases occurred in 1,976 houses; 1,529, or 57 per cent. of the cases, were removed to hospital. Of the group treated at home 72·5 per cent. occurred in houses in which there was less than one inhabitant per room. In these houses where home treatment was adopted there were 1·05 susceptible persons per house remaining. Of the hospital group only 36·2 per cent. came from houses in which there was less than one inhabitant per room, and in the houses in the hospital group an average of 2·01 susceptible persons remained. It is clear, therefore, that in the hospital group there are not only more susceptible persons, but they have to live in more intimate contact.

For the moment, we shall leave return and recovery cases out of consideration and follow the course of events during isolation only. In the 1,359 houses in the hospital group there remained 2,736 susceptibles. Only 44 began to be ill with scarlet fever between the period from seven days after the removal of the invaders to the time of their return home. The "incidental" cases in this group therefore amount to 1·5 per cent. of susceptible persons. A point of some interest is the similarity of the percentage of incidental cases to susceptible persons in the hospital groups of 0·5 to 1, 1 to 1·5, and 1·5 to 2 inhabitants per room. These cases are due either to lingering infection in inanimate objects in the house or, more probably, to mild overlooked cases, or to persons who have become breeding grounds for the infecting organism without having had any recognizable reaction—i.e., carrier cases. Apart from coincident infections, the only other possible source would be an external breeding ground, such as a midden or a defective drain, which might have been the cause of the invading cases. This last hypothesis has few supporters at present, though ten to fifteen years ago the journals contained numerous papers in which the authors evinced an unqualified belief in such sources of infection. The number of these incidental cases in the hospital group bears a constant relation to the number of susceptible persons, as also does the percentage of all cases, incidental plus return cases, infected. The return case-rate, as will be seen later, rises in the different house groups, at the same rate that the proportion of susceptible persons increases.

In the 617 houses in which patients were nursed at home, 653 susceptible persons remained, and during the period between seven days after isolation began and the time that the patient was released, 67, or 10·2 per cent., of incidental infections occurred. There does not seem to be any explanation of the big difference in the incidental infections in the two groups except that in spite of the good home conditions isolation was so imperfect that a large leakage occurred.

It has been already mentioned that, although the figures so far are entirely in favour of the hospital, the housing conditions are so different that the full extent of the gain is masked. Unfortunately, it is difficult to get comparable groups of sufficient size. Taking the hospital and home groups where the home population is from 1 to 1·5 per room, we have in the hospital group 509 houses in which 1,076 susceptible persons remained, and 15, or 1·3 per cent., incidental cases occurred. In the home group of 136 houses, 268 susceptible persons remained and 36, or 13·4 per cent., of incidental cases occurred. This enormous hospital advantage is, of course, much diminished when return cases are compared with recovery cases.

So much for what happens during isolation. We now come to the question of return and recovery cases. It will be convenient to consider recovery cases first. The 663 home-treated cases were followed by 11 recovery cases, or 1·6 per cent. The recovery case-rate seems to be very variable. Investigations by Dr. Niven show both higher and much lower rates: 1·6 per cent. is higher than is usually found. Eight of the recovery cases occurred in the group of 0·5 to less than 1 person per room, in which houses 406 had been isolated.

Before coming to the figures for return cases, I propose to discuss what one would expect to find, keeping in mind certain facts. In the first place it seems very probable that a number of patients, after an attack of scarlet fever, retain their power of infection for a long period, irrespective of the type of isolation adopted. Dr. Newsholme, in his paper on "Protracted and Recrudescence Infection in Diphtheria and Scarlet Fever," says:¹ "In the preceding pages instances have been given of protracted infection in scarlet fever in which there had been no recent contact with acute cases of that disease, and of cases in which there had been no contact during the patient's illness with any except personal infection; and it has been shown that in some of these cases infection recrudesced after an interval of apparent freedom from infection. It has also been shown that such instances of protracted and recrudescence

¹ *Med.-Chir. Trans.*, 1904, lxxxvii, p. 583.

infection occur in diphtheria when patients are treated at home; and in this disease no suggestion, so far as I am aware, has been made or could be supported, of any special hospital influence favouring 'return cases.' The known close relationship and analogy between the two diseases suggests that the explanation of the above occurrences for one disease will apply equally for the other."

I venture to refer to a chart prepared to show the rate of decrease in infectivity during the successive weeks in scarlet fever. The facts were obtained from the results of infections from overlooked cases. The details of the method employed would take rather long to explain. They were published with the chart in *Public Health* for August last year.¹ My reason for mentioning it now is that the curve, which I admit to be only an approximation to the truth, does not suggest that infection has by any means disappeared at the end of the fourth week. Assuming that an unknown percentage of patients remains unrecognizably infectious at the end of the usual period of isolation, we expect that a certain number of susceptible persons will be infected. Now it is clear that the home and hospital groups will have very different opportunities offered to them. The home cases are released to houses which are much roomier. In 74 of the 617 houses in this analysis there was less than 0.5 person per room, and in 453 of the 617, or 73 per cent., there was less than 1 person per room. On the other hand, of the hospital cases, in only 31 houses out of 1,359 was there less than 0.5 person per room, and only in 521 out of 1,359, or 38 per cent., did the patient return to a house with less than 1 person per room.

In the first place, then, the released hospital patients would, quite apart from probably receiving less careful attention and being in less favourable surroundings, be forced into more intimate contact with susceptible persons. Now, when the hospital patients were removed, they left behind them 2,736 supposedly susceptible persons, or slightly more than an average of two in each house. The home patients were isolated in homes which had 653 susceptible persons in 617 houses, or rather more than one on the average in each house. During the period in which incidental infections occurred, 44 were amongst the 2,736 in the hospital series, and these must be subtracted from the total to arrive at the presumably susceptible population awaiting the home-coming of the patient. This figure is 2,692, which is an average of 1.9 per house. The home group of supposed susceptibles was 653, amongst which 67 incidentals occurred, leaving an average of 0.9 per house. But this is

¹ *Public Health*, 1910-11, xxiv, pp. 414-17.

not a fair statement of the matter. Susceptibility is simply an assumption, and it is certain that of the group of supposed susceptible persons in each case many would be insusceptible either from forgotten previous attacks or natural immunity, or from the resistance which many have probably acquired by their fifteenth year. So that of the supposed susceptibles in the home group 10·2 per cent. have been attacked incidentally, and they are both proved to be susceptible and at the same time removed from the group, leaving it with a probably higher percentage of insusceptible persons included. Of the hospital group only 1·5 per cent. of the presumed susceptibles have been attacked by incidental infection, and therefore this group retains a much higher proportion of truly susceptible persons. The conditions, then, are that the hospital cases—which, on the average, have been more severe in type—return to meet, on the average, much greater numbers of supposed susceptible persons from which there has been practically no weeding out of the truly susceptible, and, in addition, they are forced into much more intimate contact with them, owing to the density of population in their houses.

It would then be extraordinary if "return" cases did not far outnumber "recovery" cases. The figures here are as follows: The 1,529 cases returning from hospital produce 98 return cases, or 6·4 per cent. on the cases discharged. This occurred amongst 2,692 supposed susceptible persons, hence 3·6 per cent. were infected. The home cases, 663 in number, on release from isolation produced 11 recovery cases, or 1·6 per cent. These occurred amongst 586 supposed susceptible persons, hence 1·8 per cent. were infected. Now if return cases occur simply because of the special chances which the hospital cases have of infecting, it should follow that the "return" case-rate should be high or low according to the degree of the chances conferred on the discharged patients. Five hundred and twenty-two cases in 490 houses with from 0·5 to less than 1 person per room returned to 538 susceptibles and produced 19, or 3·6 per cent., "return" cases; 591 cases in 509 houses with from 1 to less than 1·5 per room returned to 1,061 susceptible persons and produced 40, or 6·7 per cent., of "return" cases; 384 cases from 329 houses with more than 1·5 person per room returned to 1,091 susceptible persons and produced 39, or 10·1 per cent., of return cases. But in the same groups the percentage of all susceptible persons infected has remained constant. It seems certain that the home conditions have a preponderating influence on the occurrence of "return" cases. The figures for recovery cases are very small, but the same tendency is to be observed.

Lastly, there is the total effect to be considered. How far does the return case reduce the value of the saving in incidental cases. The total of incidental and return infection produced by the 1,529 hospital cases is 142, that is to say, that each hundred cases possibly infected 9·2 others. The number of supposed susceptible persons in these houses was 2,736, so that 5·1 per cent. of susceptibles were infected. The 663 home-treated cases possibly produced by incidental and recovery infections 78 cases, that is to say, each hundred cases was followed by 11·7 others. The susceptibles in the houses numbered 653, so that 11·9 per cent. were infected. So that the hospital cases, though in less favourable homes, infected less per case than the home-isolated patients and the proportion of susceptible persons in their homes infected was less than half. Picking out the most fairly comparable groups we find that in the hospital cases 522 came from 490 houses with from 0·5 to under 1 inhabitant per room, and that 546 susceptible persons were left, of whom 27 became infected. That is to say, that each hundred cases was possibly responsible for 5·1 others, and that 4·9 per cent. of susceptibles were infected. In the same house group of the home cases 406 patients were nursed at home in 379 houses in which there were only 299 susceptible persons. Nevertheless there were 28 subsequent infections. That is to say, each hundred of the primary invasions was possibly the cause of 6·8 infections, and in spite of the better conditions 9·3 per cent. of the susceptible persons were infected.

As the conditions for furthering infection increase in the two groups so the numbers naturally rise, but it may be noted that the rise in the home group is much steeper than in the hospital group, and it is evident that if home isolation had had to be adopted throughout, the number of cases of scarlet fever in the period investigated would have been very much greater. The figures, however, are not on a large enough scale to justify a detailed calculation as to the saving. Indeed, the cases kept at home in unfavourable conditions are so few that many years would have to be taken to obtain a group sufficiently large.

Dr. Malet gives in his annual report for 1907 some interesting figures:—

TOTAL FOR FOURTEEN YEARS, 1894-1907.				
	Hospital		Home	
Total houses	3,213	...	405	...
Cases occurred	324	...	135	...
Number of children after primary cases	8,472	...	777	...
Number of these attacked	405 or 4·8 per cent.		187 or 24·1 per cent.	
Number possibly due to failure	201 or 2·4	..	124 or 16	..
Number of children escaping	8,067 or 95	..	590 or 75·9	..

This table, however, does not include return cases, which were estimated at 254. Dr. Malet has always taken a great interest in return cases, and it is instructive to compare his views in 1907 and in 1893. In 1907 he said: "Analogy suggests that in scarlet fever also, in some cases infection may be prolonged far beyond the complete recovery of the patient." Now for many years Dr. Malet has given special attention to this matter, and the change in his view is striking.

In 1893 he wrote: "Infection could only be taken home by a discharged case in three ways. First, in his own body, through his not yet being thoroughly free; second, in his clothing, through some defect in disinfection; third, by some germs settling upon him (as dust) after he had been cleansed for discharge. I am confident that in none of our cases was the first cause operative. The stay in the hospital was too long, and every case is carefully examined by myself before I discharge it."

There is no doubt that there has been a general trend of opinion towards the belief in the greater part played by personal infection.

Many good observers believe that it is possible to decrease the normal percentage of infective discharged patients, and hence the return case-rate, by special treatment in hospital. This may well be true. The advocates, however, vary considerably in their routine, and no one has yet persuaded his colleagues, in spite of their eagerness for any new thing which promises to prevent return cases, that his method is successful. However, allowing that certain lines of treatment in hospital may diminish the number of return cases, this is only equivalent to saying that the percentage of cases discharged whilst in a condition of protracted infection has been reduced. It does not in any way follow that the infectivity which has been got rid of was acquired through segregation in hospital. Any successful routine could presumably be equally well applied to the home cases with a consequent reduction in the recovery-rate.

CONCLUSIONS.

(1) In Manchester the great majority of the cases of scarlet fever nursed at home are in houses with less than one inhabitant per room. A considerable majority of the houses from which patients are removed to hospital have one or more inhabitants per room.

(2) The average number of susceptible persons per house is twice as high in the homes of the hospital cases as in the homes of the other group.

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(3) The difference between the percentage of susceptible persons infected in the two groups during isolation (counting only cases occurring after the seventh day) is so great that it is evident there is a great leakage of infection occurring during home isolation.

HOSPITAL ISOLATION GROUP.

Density of home population	Number of primary invasion cases	Number of houses in which cases occurred	Number of susceptible persons left	"Incidental" infections	Return cases	Total number of susceptible persons infected	Percentage of "incidental" cases to susceptible persons	Percentage of return cases to patients isolated	Percentage of susceptible persons infected	Number of susceptible persons infected to each 100 primary cases
In this line the figures relate to homes with less than 0.5 inhabitant per room	32	31	2	0	0	0	—	—	—	—
0.5 to less than 1 inhabitant per room	522	490	546	8	19	27	1.4	3.6	5.1	5.1
1 to less than 1.5 inhabitants per room	591	509	1,076	15	40	55	1.3	6.7	5.1	9.1
1.5 to less than 2 inhabitants per room	313	268	882	13	32	45	1.4	10.2	5.1	14.3
2 or more inhabitants per room	71	61	230	8	7	15	—	—	—	—
All hospital cases ...	1,529	1,359	2,736	44	98	142	1.5	6.4	5.1	9.2

HOME ISOLATION GROUP.

Density of home population	Number of primary invasion cases	Number of houses in which cases occurred	Number of susceptible persons left	"Incidental" infections	Recovery cases	Total number of susceptible persons infected	Percentage of "incidental" cases to susceptible persons	Percentage of recovery cases to patients isolated	Percentage of susceptible persons infected	Number of susceptible persons infected to each 100 primary cases
Less than 0.5 inhabitant per room	75	74	14	4	0	4	—	—	—	—
0.5 to less than 1 inhabitant per room	406	379	299	20	8	28	6.6	1.9	9.3	6.8
1 to less than 1.5 inhabitants per room	147	136	268	36	3	39	13.4	2.0	14.5	26.5
1.5 to less than 2 inhabitants per room	33	26	66	7	0	7	—	—	—	—
2 or more inhabitants per room	2	2	6	0	0	0	—	—	—	—
All home cases ...	663	617	653	67	11	78	10.2	1.6	11.9	11.7

(4) When return cases and recovery cases are considered with the incidental cases there is, in spite of the worse home conditions, a big gain remaining in the hospital group, the percentage of susceptible persons infected being less than half that in the group of home cases, and the actual number of cases credited to each group of one hundred primary invasion cases is less than that in the home group in spite of the great difference in the chances for infection offered. If home and hospital isolation were adopted in a large series of similar households the gain demonstrated in hospital isolation would presumably be much greater.

(5) If it is allowed that a small percentage of all scarlet fever patients remain unrecognizably infectious for longer periods than the usual time of isolation, then the conditions to which the hospital patients return are, in comparison with the home treated cases, so favourable for the production of further infections, that it is probably unnecessary to seek any other explanation of the known great excess in the percentage of return cases over that of recovery cases.

Appended is a table which gives all the figures on which this paper is based. It should be kept in mind that the table refers to a certain period of fifteen months, and the percentages would probably be found to vary considerably from year to year.

DISCUSSION.

The PRESIDENT (Dr. Theodore Thomson, C.M.G.) thanked Dr. Arnold most heartily, in the name of the Section, for his admirable paper. It was a model of lucidity and brevity, and of close and consecutive reasoning. The subject was very interesting to all who had had to discharge the duties of Medical Officer of Health, and it also interested those who were Medical Superintendents of Infectious Diseases Hospitals. Much trouble had been caused by complaints of householders when the disease broke out after the return of patients from the hospital. Dr. Arnold had carried the war into the enemy's camp, and instead of attacking the hospitals he had attacked the homes. The case had never before been brought home to him so well as by this paper. The figures were presented in a very impressive way, and the contribution showed that hitherto sufficient attention had not been paid to that side of the question.

Dr. TURNER thanked the author for his valuable paper, and for the thoroughness with which the facts recorded were worked out. He gave the following figures, the result of a year's records at his own hospital. In 269

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cases more than one patient had been admitted from one house, and the following shows the interval in weeks from the admission of the first to the second case:—

INTERVAL IN 269 SECONDARY CASES.

Weeks	No.	Weeks	No.	Weeks	No.
1	75	11	16	21	—
2	29	12	11	22	—
3	12	13	8	23	—
4	13	14	6	24	1
5	11	15	3	25	3
6	5	16	7	26	2
7	9	17	8	27	—
8	15	18	4	28	—
9	16	19	4	29	—
10	15	20	2	30	—

The first 75 cases would, in Dr. Arnold's scheme, be grouped with the primary cases. Of the remainder, 32 were "incidental" and 162 "return" cases.

Dr. E. W. GOODALL said that those who were responsible for the management of fever hospitals must have listened to Dr. Arnold's paper with very great satisfaction, if they adopted without hesitation the conclusions at which he had arrived. But the author had guarded himself by pointing out that the number of cases with which he had dealt was rather small, compared with the large amount of scarlet fever prevalent throughout the country. Doubtless the author would agree that still further investigation was needed to put the subject on a secure basis. He was glad to see that, incidentally, the author negatived the idea that patients suffering from scarlet fever became more infectious, and that the virus was increased in potency by the sojourn of the patient in hospital. It was an idea he (the speaker) had never believed in. In 2,000 cases at the Eastern Hospital which he had investigated, the results went to show that there was no valid evidence either in favour of the view that the patients became more virulent while in hospital, or that the different complications which were supposed to be a source of infection were handed on from one patient to another. He did not know whether Dr. Arnold would go so far as to say that infected articles were no longer to be taken into account. He (the speaker) would not go so far as that, because he regarded the scarlet fever organism as one which it was difficult to kill, and which was capable of adhering to all sorts of articles for a long period. Dr. Arnold had said nothing about those instances, well known in fever hospitals, in which patients had been ordered to be discharged, but at the last minute had been detained. Yet in two or three days another patient was admitted from the same house suffering from the disease. Such cases supported the view that infection might hang about articles as well as about the patient himself. But he agreed with the main thesis, that it was the patient himself who had to be looked to, and that the infection lingered about him more than was generally thought. He was glad the author had emphasized the time limit. In the Asylums Board hospitals they had always taken three months. But there should be no limit at all if

the facts were wanted. By limiting the time to two or three weeks one would fail to detect the chronic cases of infection. In a discussion on the paper read by Dr. Butler three years ago he (Dr. Goodall) had brought forward an instance of a boy who was chronically infected for the best part of two years, and was intermittently infectious, just as one found typhoid fever carriers were. Papers like Dr. Arnold's and Dr. Butler's showed that it was not so much the infected house which was the factor as the person. And Dr. Arnold's paper was particularly interesting because he had investigated the conditions under which the discharged patients lived. He was disappointed that Dr. Turner had not said more on that topic, because he had paid special attention to the question in regard to the report which Dr. Cameron made to the Metropolitan Asylums Board some years ago. In Dr. Cameron's report it was distinctly shown that the incidence of return cases was larger in some of the London boroughs than in others. In the observations which the Medical Superintendents made to the Board on Dr. Cameron's report, that question was still further gone into, and Dr. Turner worked it out with great labour, and showed that so far as the figures went, the borough was a greater evil than the hospital in respect of return cases. A question which Dr. Arnold touched very slightly on was the condition of the patient; and if, as was hoped, he intended to continue the inquiry, it would be a great help if he would investigate the condition of the discharged patient from a clinical point of view. There was an impression that the patients who had suffered from certain complications, by no means severe, such as chronic discharges from the nose and morbid conditions of the throat, were more likely to cause return cases than others. Since the publication of Dr. Cameron's report and the criticisms of the Medical Superintendents, Dr. Turner, after further inquiry, had concluded that too much stress had been laid on the importance of these morbid conditions. So that one could not say, with regard to the condition of the patient, whether he would be chronically infectious or not. Dr. Arnold's paper raised the whole question of the continued prevalence of scarlet fever in this country. For many years past attacks had been made on the fever hospitals. It had even been said that, so far from lessening the prevalence of scarlet fever, they tended to perpetuate it. Some of the papers on the subject had been mere statements unsupported by evidence, but Dr. Millard, the Medical Officer of Health of Leicester, had endeavoured to prove by statistics that the isolation hospital had had very little effect on the prevalence of scarlet fever. Yet if one accepted the view that the patient was the source of infection, there should by now have been some evidence that the hospitals had had some influence on the occurrence of the disease during the last twenty years. Up to a few years ago, however, there was very little evidence to that effect. Whether the difference in the case—mortality of the disease—was due to the hospitals was another question, which it required a larger body of evidence to settle than Dr. Arnold had at his disposal. But he thought that those who were responsible for the administration of fever hospitals, whether superintendents or medical officers of health, were entitled, after reading a paper such as this, to congratulate themselves that, after all,

the hospitals had not been such harmful places as some people had tried to make out, but that they had been of distinct advantage to the community.

Dr. BUTLER expressed his thanks to Dr. Arnold for the paper, which treated a very interesting problem in a definite way. He believed that the method of classification according to the density of the population in the homes was new, and it seemed to have definite relationship to the number of return cases. Holding the views which he did, that return cases were not due to hospital isolation, he found cause for gratification in such a paper as this. But one had very indefinite data in return cases. He supposed it was customary to accept occurrence of a case after return as evidence of an infecting case having been discharged from the home or from the hospital. One was apt to slide over a difficult administrative problem in neglecting all the other return cases which were not so classified but which might equally come from that infecting case. It would be much better if one could use as a datum not the return cases themselves, but the return infecting case. It was curious that attention should be almost limited to a single return case. If the case from hospital was in an infectious condition, it was scarcely conceivable that it should cause only one case. And as that number would be variable according to the home or other conditions, any figures based upon it would be misleading. If infected cases were taken as a basis of classification, more definite results would be obtained. For several years he had given both the return infecting cases and the return cases to which they gave rise, so far as they had been traced. But he was now convinced that, if the machinery were sufficiently perfected, they would find return cases bore a greater ratio than was supposed to return infecting cases. During the last few years he had noticed that the number of return infecting cases, expressed as a percentage of total cases discharged, increased as the incidence-rate for scarlet fever increased in a district, and declined with it. He would read the figures for 1905 to 1911, the percentage of return infecting cases and incidence-rate per thousand population. The percentage of return infecting cases to total cases was as follows:—

1905	...	...	3.5	1909	...	...	8.7
1906	...	...	3.6	1910	...	...	4.7
1907	...	...	4.2	1911	...	...	3.11
1908	...	...	6.9				

During the same years the incidence-rate was as follows:—

1905	...	...	2.8	1909	...	...	4.4
1906	...	...	4.5	1910	...	...	2.0
1907	...	...	4.4	1911	...	...	2.1
1908	...	...	5.0				

It was curious that the return cases should follow the same law as the incidence of the disease. If the return case was due to the home conditions or to the condition of the patient, it need not bear the same ratio to the total cases as those cases did to the incidence on the population. If it were so, it suggested that what had to be recognized was that the return case was not a result

but probably a cause; that the conditions which made for epidemicity of the disease made also for increased infectivity of cases which gave rise to returns. And in that might lie the explanation of the perpetuation of scarlet fever and other diseases of like character. The evidence that persistence of infection was due to the hospital received little confirmation as experience was increased, but he had been struck with the fact that the migration of the return infecting case was a very important matter. He was not sure that that was not an explanation of the difference between the recovery cases and the return cases, because even the figures which Dr. Arnold had produced showed an increase of return cases for the same class over the recovery cases. There were fewer recovery cases for a population of a given density than return cases for the same population, notwithstanding the fact that the recovery cases occurred among a better class of the population as a whole. The cases did not migrate after their recovery, but maintained the same conditions. Hospital cases came from a different environment, and both recovery cases and hospital return cases seemed to occur with much greater frequency in patients who moved about. Patients discharged from the Metropolitan Asylums Board hospitals caused a much larger proportion of return cases in his own district than did patients discharged from his own hospital. If he could follow his own cases he would probably find they would give rise in other districts to a greater proportion of return cases. Cases which had been sent to the seaside during convalescence, even when they had been isolated at home, gave rise, when they went back, to a greater number of cases than others. That was only an impression, and one which it was difficult to establish from figures.

Dr. CROOKSHANK said his pleasure at hearing the paper was enhanced by the fact that the conclusions to which the author had come were welcome to him, as he had always advocated the hospital method of treating scarlet fever, as opposed to the home method. But he had some misgivings as to the validity of the application of the statistical method to this problem, because the factors concerned were so variable that it was difficult so to reduce them as to make a just comparison. For that reason, when dealing with the matter in the past he never had recourse to statistical methods, but had fallen back on the so-called unscientific process of reasoning from general principles and observations. One factor favourable to hospital methods was brought out by the author, but he (the speaker) feared lest some counter-argument might be brought forward by statisticians on the other side. In attempting to estimate the value of the two methods attention should not be concentrated in looking for results on the "notified cases"; and he was in considerable agreement with what Dr. Butler had said. Notified cases were what the public called "concrete facts," and it appealed very much to the public if one was able to say that there were so many "notified cases" following one sequence of events, and so many after another. But the "spread of infection" did not equal the occurrence of "notified cases." Though in opening the author had said: "In this paper I propose to show the

effect upon the *spread of infection* of scarlet fever, of isolation in hospital, as compared with isolation at home"—what he had shown was the effect upon "notified cases" of scarlet fever treated in one set of circumstances as compared with scarlet fever isolated at home. He submitted, again, that the "spread of infection" differed from the "occurrence of notified cases." He was not referring for the moment to the mild cases of scarlet fever, which sometimes escaped recognition, or even to "simple" carriers, though the production of carrier cases—if carrier cases could be produced by cases returning from hospital—was not easily revealed by "notifications," even after a considerable time. He agreed with Dr. Goodall as to the inadvisability of fixing a time limit, because he thought a case might come from hospital and set up cases which were carriers and produced scarlet fever after a considerable time, which would not be caught in the meshes of Dr. Arnold's statistics, but would yet be due to the cases returning from hospital.

He had been reading a paper by Calmette—a paper which had not yet appeared in the English journals, but would shortly so appear—in which that author made some very interesting suggestions, leading to the notion that there might be a considerable diminution of cases of fatal phthisis in a community, due to the fact that the mass of the people were becoming more "tuberculized," and thus "immune." Perhaps that had been the case in this country during the last thirty years. He (Dr. Crookshank) did not suggest that everything said about chronic infections like tuberculosis applied to scarlet fever, but this illustrated a point which should not be forgotten in considering the effects of hospital as opposed to home treatment. Following up Calmette's ideas on immunity, the phenomenon of the home secondary cases occurring within a day or two of infection of the first case depended on the associates of the first case getting exposed to a massive and overwhelming infection, to which they fell victims. But, supposing these associated children manifested some resistance at first, or supposing the infection not to be too massive, and the child suffering from scarlet fever still kept at home, the associates in the house probably got repeated moderate infections, immunizing in effect. And that was why scarlet fever patients did not turn up at home during the fourth to the sixth week that the child first ill was kept at home. But if the scarlet fever patient were removed at an early stage, before he had given any massive infection to his brothers and sisters, and if he came out of hospital at the sixth or seventh week still in an infective condition, he probably brought back a massive infection to what was practically virgin soil, because the children at home had not been exposed to repeated small infections. Then one got the return case. And in that lay one explanation of a fact which Dr. Butler brought out, that one got return cases particularly when the case discharged from hospital went straight away to the seaside, because it went among a family which had not had immunizing doses of scarlet fever for the previous six weeks. The same explanation had some reference to what he had also noticed—that when better-class patients were admitted into hospital more return cases occurred amongst the families than in poorer cases, although

in this instance there might be, according to Dr. Arnold's showing, fewer susceptible persons. The author used the term "susceptibility" in a sense different from that in which he would use it himself. He would use it as having reference to the fact that a person had not been exposed to repeated immunizing infections. If a child were kept at home and could immunize its family, although the family might not furnish a definite number of notified cases, still the immunized family were probably carriers, in the French meaning of the term. And the question was whether more harm was done by a child remaining at home and immunizing its family and converting the members into potential carriers who spread the disease later on; or by allowing the child to go to hospital, even though it might come home in an infectious state and set up a frank case of scarlet fever, which could be removed. He thought the greater harm was done by the child remaining at home.

There were three ways of dealing with infectious diseases: The old individualist way, allowing considerations of public health to take care of themselves. That was obsolete. The second was to immunize the community, as had been done for many years in the case of small-pox, and, unconsciously, in the case of tubercle for the last thirty years. If scarlet fever cases were kept at home, it was also being done, in a half-hearted way, in connexion with that disease. Measles was nowadays treated at home, but with more care than formerly, and so we were ceasing to immunize the community in the way we used to. The other method was to try to destroy the sum-total of the virus, and that was what had been attempted in the case of malaria. It had been done also perhaps in the case of typhus by doing away with bed-bugs. And by removing every case of scarlet fever to hospital and treating it on disinfecting lines, one was doing something to reduce the total amount of the virus, but not causing immunization. The two latter methods were not comparable, and the truth would not be arrived at by estimating results from statistical investigations. It used to be thought that the "immune person," he who did not get a disease twice, was a cured patient. But if one fell back on analogy with another chronic disease, that was not so. When a patient suffering from syphilis was cured of his syphilis by salvarsan, and a negative Wassermann reaction procured, that patient ceased to be immune. In France people had been found to have returned to the hospital two or three times a year with the primary disease after having been "cured" of it. They were "immune" only so long as they were carrying about in their bodies a weak focus of the disease. The same was true of tubercle. People in adult life, who were called "immune," were those infected in early life, who had some tuberculous glands hidden away which were keeping up their "immunization." If those people were "cured" of their tubercle they ceased to be "immune," and were likely to fall victims again. He suggested that all these new facts and conceptions must be reckoned with, and that they tended to increase the strength of the general arguments used in favour of the hospital isolation of scarlet fever as opposed to home isolation, although they showed how difficult it was to estimate results by statistical methods.

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Dr. G. W. JOHNSTONE said that Dr. Crookshank had drawn a somewhat alarming picture, which if it were true would indicate the necessity of all of us speedily becoming infected in order to render ourselves immune from all sorts of infections. It would seem, moreover, that the power of resistance to disease possessed by the ordinary healthy human being to which we have hitherto trusted was visionary. This, however, seemed to be carrying the theory too far.

Mr. M. GREENWOOD, jun., remarked that the author had advanced reasons for believing that home conditions greatly influenced the frequency of "return" cases. Were this not so, it might be anticipated that the ratio of such cases to the number of susceptible persons at risk would increase steadily as the ratio of discharged hospital patients to susceptibles increased. In the three groups formed, the ratios of hospital discharges to susceptibles were $\frac{522}{539}$, $\frac{591}{1061}$, $\frac{384}{1591}$, but the incidence of "returns" upon susceptibles was sensibly constant. This seemed to indicate the very great importance of home conditions, as urged by the author. Further work upon this point seemed desirable, owing to the difficulty of weighing the chances of infection in different groups. The only other point which appealed to him, as an outsider, was that the method which had been adopted by Dr. Arnold was the only one applicable to a subject of this kind. It was easy to propound any number of theories as to why certain facts were as stated, but the first duty was to ascertain whether the facts *were* as stated. From the statistical point of view he did not think it could be questioned that Dr. Arnold had adduced good reasons for believing that the result of the hospital method was the production of a smaller total number of cases than the other method. As to the ultimate reason of that difference, it might be a matter of speculation. Such speculations might be interesting, but in the absence of scientific evidence were not of very special importance to those who had to carry out the administration.

Dr. HAMER asked whether Dr. Arnold had considered the question of distribution in time of "return cases" to which Dr. Turner alluded, and more particularly the increase in the number of cases notified from homes, to which hospital patients returned, occurring after the lapse of some seven or eight weeks. Dr. Turner gave the figures for successive weeks as follows: 29, 12, 13, 11, 5, 9, and so on; succeeding that came a rise in the numbers up to 15, 16, 15. The same phenomenon was very well brought out in Dr. Seaton's figures, namely, the rise at the eighth, ninth, and tenth weeks. That increase had been held to furnish conclusive proof of the operation of a special infectivity manifested by returned hospital cases, and he confessed he had always felt disposed to admit the validity of that contention. But of late he had been much struck with the enormous part which suggestion seemed to play in this connexion. Dr. Crookshank had alluded to that, and had pointed out that they were dealing with notified cases, not with infections. He (Dr. Hamer) wondered whether they might not here find explanation for the additional number of cases from the eighth to the tenth week. They were dealing, of course, with notified cases,

and they found that the number of cases notified in those weeks was larger than in preceding and following weeks. Might not the explanation be that the fact that the child had returned from hospital led to notification being made, while it would not have been made if the child had not just returned from hospital? Thinking on these lines one was rather confirmed in the view suggested by the smallness of the rise which occurred in the eighth, ninth, and tenth weeks. If the cases sent out from hospitals were especially infective, surely the rise in the numbers might have been expected to be much more marked than it was actually found to be. Following the matter further, one was carried along to Dr. Butler's point, that when a case migrated infection occurred. If the child went, say, to Brighton—i.e., to a new environment—it was in people's minds that there ought to be a return case. So too if a Metropolitan Asylums Board patient were sent back into Willesden, it might be that there was a more critical study made of circumstances relating to the case than would have been undertaken had the patient merely been returned home out of the Willesden hospital.

Dr. WILLIAMSON said, in regard to the difference between the results of the systems of hospitals and home isolation, that in some figures which he got out and contributed to Dr. Seaton's book, he showed that two-thirds of all the secondary cases from either home isolation or hospital isolation occurred before the isolation of the first case at either home or hospital. He did not know whether in Dr. Arnold's tables the figures relating to secondary cases excluded those early cases. In his own figures two-thirds of the secondary cases could not be prevented. No one knew of the first case until the secondary cases had occurred. So that in comparing the percentage of cases, even if the number of later hospital-isolated cases was small, those earlier two-thirds must be added to the smaller figures in the one case, and the larger figures in the other, and the total difference was not so marked as it would otherwise appear.

The PRESIDENT said he thought the satisfactory solution of this question could only be attained by study in the direction in which it had been carried out by Dr. Arnold. A lively time had been experienced in regard to attacks on fever hospitals, and the manner in which figures on the subject had been collected and presented did not always carry conviction, because of the many obvious fallacies involved. For instance, comparison had been made between districts with hospital isolation and districts without hospital isolation. To base argument on that was not the way to get useful results. The home conditions in these districts might vary widely. The possibility of children spreading infection would vary widely with the condition of the home. And it was also necessary to consider the hospital conditions, because not all hospitals were equally well administered. Moreover, the degree of infectivity of scarlet fever outbreaks in different districts was little likely to be the same. He thought that those who had claimed that there was no benefit to be derived from hospital isolation were foolish. The merit of Dr. Arnold's paper—and it was not the

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first time he had expressed his appreciation of the manner in which Dr. Arnold did his work—was that he compared conditions which were properly comparable. In the main the principle was sound, and it was along that path that a satisfactory conclusion was likely to be reached. There was nothing he himself enjoyed more than a theory based upon general impressions. The fewer the data the easier it was to theorize; but the administrator wanted hard facts of which he could be sure, and comparison of data which were justly comparable.

Dr. ARNOLD, in reply, expressed his thanks to Members for the way in which they had discussed his paper. In answer to Dr. Williamson, all the cases which occurred in the houses were included in one or other of the columns, but the aim was to avoid any case being put down as incidental which might have been infected by a previous case directly before it was isolated in the house. Taking the hospital group, there was a big difference between the number of primary invasion cases and the number of houses in which they occurred. Cases occurring in the first week, probably from direct infection, did not get into the incidental cases, nor did cases occurring later if there had been an intermediate case. Column 1, with column 6, would give the total number of cases. The total primaries were 1,529, 44, and 98. Dr. Turner's original work was most interesting, and it was looking at his demonstration of return cases and the rate in different boroughs which made him (the speaker) think it was worth while going into detail concerning the home conditions. In reference to Dr. Goodall's remarks, complications at times seemed to be secondary elements which might be infective; but he did not think hospitals had any other influence upon cases. He avoided making any direct statement in regard to infected articles, but he believed that from time to time infection might be carried in that way. The clinical condition could not be investigated in this series, because the inquiry was conducted two years afterwards. He had taken the Health Office sheets, and nothing was known as to the exact condition of the patient on discharge, if no return case occurred. Dr. Butler's remarks were most instructive. One seemed to have more trouble when things began to be busy with return cases than later on; when the incidence-rate dropped, the return case-rate dropped at the same time. Dr. Crookshank's remarks were of wide interest. With regard to the notified cases, it was a suggestion of caution. In reference to Dr. Hamer's remarks as to the returns at the ninth to eleventh weeks, his own cases were too few to enable conclusions to be drawn. He had the figures, but he did not think it worth while to include them.

Epidemiological Section.

April 26, 1912.

SIR SHIRLEY MURPHY, Vice-President of the Section, in the Chair.

The Bed Isolation of Cases of Infectious Disease.

By C. RUNDLE, M.D.

I HAVE to thank you for this opportunity of dealing with a subject of much controversy. A recent contribution by my colleague, Dr. Burton, and myself, on the "Bed Isolation of Cases of Infectious Disease," has involved me in considerable debate, and I am fortunate in being afforded this occasion for hearing your criticisms and obtaining, I hope, your advice. The principles upon which the system of bed isolation is founded are already sufficiently well known, and I purpose in this paper to confine myself to an explanatory note of the results obtained, rather than to a detailed account of the methods employed. Elaboration of ritual in the separate nursing of the prime infections has tended perhaps to obscure the one factor essential to success—surgical cleanliness—and my experience has convinced me that it is to the intelligent co-operation of the individual that we must look for a successful issue to this work, rather than to the written regulation. We have had the advantage of occasional visits from members of this Section during the course of our investigations, and I think I have detected a shade of disappointment in the simplicity of the methods employed.

The plan and appointments of the Ward Pavilion used for the purpose of bed isolation are sufficiently indicated by the sketch (fig. 1, p. 173), and need not be referred to in detail.

I will briefly recapitulate from a recent publication¹ the measures which we employ, and will then proceed to a more critical examination of the results obtained.

"The hospital has had the advantage of possessing a highly trained sister in charge of the ward pavilion with special surgical and fever experience,

¹ *Lancet*, 1912, i, p. 720.

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who has supervised the wards since their inception. Each ward, male and female, is in charge, under the sister, of a general hospital-trained nurse with some fever experience. One probationer is also allocated to each ward. The night staff consists of two nurses, one of whom has frequently had three years' general training. The wards are consequently well staffed both as regards the number and the qualifications of the nurses in charge. Each case of puerperal fever is placed on admission in the side ward off the operating theatre until it is decided what operative measures, if any, may be required. As long as active treatment, such as douching, is required, the nurse in charge is not allowed to assist in the dressing of any case of erysipelas or cellulitis. Coats are worn by the doctor and nurse when attending to the case, and rubber gloves if douching or dressing is needed. When the operation has been performed and another case has been admitted requiring operative treatment, the first case is transferred to the main ward. Thus during the same week there were six cases of puerperal fever in the main ward and one case in the side ward.

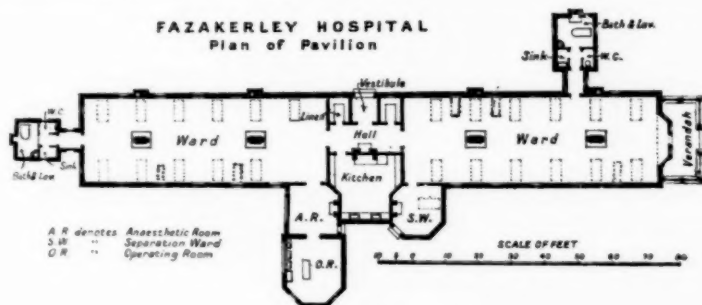
"The cases of erysipelas and cellulitis are treated with ordinary cleanliness only, no special isolation measures being adopted. The same remark applies to patients having no infectious disorder, but some such condition as lobar pneumonia or a non-infective skin disease.

"With cases of varicella, pertussis, and doubtful or genuine cases of scarlet fever or diphtheria, more rigid measures are adopted. Two long coats kept for each case are worn, one by the doctor and the other by the nurse, whilst examining, or attending to, the patient. Drinking vessels, knife, fork, spoon, and spitting mug are boiled after use, and separate sanitary utensils, bowl and brush for washing, and bath blankets are reserved for the use of each of these patients. No interchange of toys or books is permitted. After removing the coat worn in attending to the case, the doctor or nurse washes the hands before proceeding to another patient. For this purpose a table with three bowls is kept half-way down each ward. Additional bowls are placed on the locker of the patient concerned, if isolation measures are likely to be prolonged, or if the case is requiring frequent attention.

"The diseases which are admitted to the ward are as follows: (1) All cases of puerperal fever and erysipelas, and most cases of pertussis, rubella, and varicella. (2) All cases notified as suffering from an infectious disease, but found on admission to have no infectious conditions. (3) Cases in which the diagnosis is doubtful and observation is necessary, such as "query" scarlet fever or diphtheria cases. (4) Cases from other wards in the hospital requiring operative treatment in which the after-treatment may be prolonged. (5) Cases of diphtheria or measles when the wards receiving these patients are pressed by a sudden rise in the incidence of the disease. (6) Cases of epidemic diarrhoea when these are few in number."

The lists of cases to which I shall refer later suggest the questions, how many of these patients are to be regarded as having been admitted

in an infectious stage of their illness? and how many may be considered to have been free from infection, and practically harmless to others, when first brought under treatment? A short reference to the conditions under which this work was begun, and has been continued, will explain the difficulty I have in stating definite figures in reply. Our bed isolation ward was primarily utilized more than two years ago to take convalescent transfers from the scarlet fever, diphtheria and measles wards of the hospital, when these wards were full. These transferred patients are separately noted on the tables which I shall present to you: they were commonly in a non-infectious condition, and the majority were promptly discharged to their homes. At a later stage, vacant beds in this ward were used for the reception of doubtful cases on admission, that is to say, for cases which are usually admitted to



separation or side wards. The general character of this type of case will be familiar to all. We were encouraged by the absence of cross-infection to proceed a stage further and to include definite cases of the acute infectious diseases for which we had no accommodation elsewhere.

The infections quoted in our tables, other than convalescent transfers, were admitted direct to our bed isolation ward when first brought to hospital. Thus our system has undergone a process of gradual evolution, the type and stage of disease have varied from month to month, and any classification into acute and chronic groups would be purely arbitrary. I will refer to this subject later by lantern slide, and perhaps those members who have been good enough to visit Liverpool will convey to the meeting their impression on this point.

"Temperatures are taken in the axilla and the thermometers washed in lysol after use. In the case of patients suffering from varicella or enteric fever a separate thermometer is kept for each patient.

MY—5a

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"If the case is one of the prime infections mentioned this routine is adopted until the patient is considered non-infectious; in cases of doubtful diagnosis until a negative opinion is arrived at. The patient is allowed to get up when all signs of acute disease likely to prove infectious have subsided. From now on he is allowed to mix freely with the other convalescent patients until discharged, provided that he is not a scarlet fever or diphtheria patient with rhinorrhœa or otorrhœa, in which cases a longer stay in bed is adopted, in the former case until the rhinorrhœa has ceased. Special precautions are, of course, adopted in dealing with nose or ear discharges. The convalescent transfers from other wards are similarly allowed freely to mix with the convalescent patients of the ward."

The total number of cases admitted to the ward during the years 1910 and 1911 (to March, 1912) was 741. Of this number, as will be seen in the following table, twenty-eight showed no actual disease; a large proportion of these twenty-eight cases were babies admitted with their mothers, the latter suffering from puerperal fever.

During the two years under review the number of patients who developed an infectious disease whilst under treatment was two. One instance occurred in a girl, aged 7, who had been admitted suffering from rubella, but notified as a case of scarlet fever. After fourteen days' stay in bed she was allowed up, but thirteen days later was again confined to bed with a typical attack of scarlet fever. She had mixed freely with a child who had undergone a mastoidectomy, having been transferred from a scarlet fever ward for the purpose of this operation. This infecting case had been in hospital for nearly four months when discharged, and was still infectious enough, possibly from intermittent otorrhœa, to cause the return of three other children with sharp attacks of scarlet fever a few days after returning home. The lasting virulence of the organism in this case sufficiently accounts for this cross-infection occurring in the ward.

The other secondary case was that of a girl, aged 10, admitted with a mild attack of faucial diphtheria. After twenty-eight days in bed she was allowed up, and in six days' time developed scarlet fever. There were other cases of scarlet fever in the ward at the time.

In the list of cases given, attention may be drawn to the large number of non-infectious patients, many of whom—as, e.g., those suffering from epidemic diarrhœa—were young children. None of these contracted any infectious disease while in the ward.

It has been argued that a fairer estimate of the value of our methods is to be obtained by a consideration of the number of prime infections under treatment at one time, than by a survey of the total dealt with

TABLE GIVING VARIETIES OF CASES ADMITTED DURING THE YEARS 1910 AND 1911
(TO MARCH, 1912).

<i>Infectious Diseases.</i>						
Disease				Total cases		Convalescent transfers
Scarlet fever	...	...	...	76	...	19
Diphtheria	...	...	...	42	...	16
Measles	...	...	...	42	...	29
Rubella	...	...	...	13	...	6
Varicella	...	...	...	41	...	12
Pertussis	...	...	...	13	...	0
Scarlet fever and pertussis	...	...	...	3	...	1
Measles and pertussis	...	...	...	3	...	1
Varicella and paratyphoid fever	...	...	...	1	...	0
Diphtheria and scarlet fever	...	...	...	2	...	1
Typhoid fever	...	...	...	13	...	0
Puerperal fever	...	...	...	42	...	0
Erysipelas	...	...	...	233	...	0
Vincent's angina	...	...	...	1	...	1
Anthrax	...	...	...	1	...	0
Cerebrospinal fever	...	...	...	1	...	0
Total	...	...	...	527	...	87
<i>Other Diseases.</i>						
					Total cases	
Phthisis	...	...	...	...	3	
Tuberculosis of other organs	...	...	...	...	4	
Lobar pneumonia	...	...	...	...	4	
Empyema	...	...	...	...	3	
Bronchitis, broncho-pneumonia	...	...	...	...	18	
Laryngitis	...	...	...	...	1	
Tonsillitis	...	...	...	...	58	
Retro-pharyngeal abscess	...	...	...	...	1	
Ulcerative stomatitis	...	...	...	...	1	
Alveolar abscess	...	...	...	...	1	
Gastro-enteritis, epidemic diarrhoea	...	...	...	...	33	
Dyspepsia, constipation	...	...	...	...	2	
Nephritis	...	...	...	...	1	
Myocarditis	...	...	...	...	1	
Conjunctivitis	...	...	...	...	5	
Syphilis	...	...	...	...	2	
Acute rheumatism	...	...	...	...	2	
Anæmia	...	...	...	...	2	
Carcinoma	...	...	...	...	2	
Chorea	...	...	...	...	1	
Rickets	...	...	...	...	2	
Icterus neonatorum	...	...	...	...	1	
Marasmus, malnutrition	...	...	...	...	8	
Cellulitis, septic wounds	...	...	...	...	9	
Cutaneous abscesses, mastitis	...	...	...	...	3	
Skin diseases	...	...	...	...	18	
					186	
No disease	...	...	...	...	28	

during a protracted period. The following figures, though less formidable than the above, sufficiently indicate the nature of the cases under simultaneous observation. For this purpose I have selected dates at varying periods throughout the year in order that those diseases may be included which have a seasonal incidence. Thus there were under

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treatment patients suffering from the following diseases on the attached dates :—

TABLE A.
February 11, 1911.

Scarlet fever	...	...	...	2
" " (transfers)	...	...	...	2
Diphtheria	...	...	...	3
Rubella	...	...	...	1
Pertussis	...	...	...	2
Typhoid fever	...	...	...	2
Mastitis	...	...	...	1
Erysipelas and cellulitis	...	...	...	6
Lobar and broncho-pneumonia	...	...	...	2

Total ... 21

TABLE C.
November 11, 1911.

Scarlet fever	...	...	...	3
Typhoid fever	...	...	...	2
Varicella	...	...	...	2
Puerperal fever	...	...	...	2
Erysipelas	...	...	...	13
Broncho-pneumonia	...	...	...	1
No disease	...	...	...	1

Total ... 24

TABLE B.
June 11, 1911.

Scarlet fever	...	...	...	3
" " (transfers)	...	...	...	2
Diphtheria	...	...	...	1
Rubella	...	...	...	2
Scarlet fever and pertussis	...	...	...	1
Pertussis	...	...	...	1
Varicella	...	...	...	2
" (contact)	...	...	...	1
Phthisis	...	...	...	1
Erysipelas and acute phthisis	...	...	...	1
" " cellulitis	...	...	...	5
Puerperal fever	...	...	...	1
Empyema	...	...	...	1
Epidemic diarrhoea	...	...	...	1
Tonsillitis	...	...	...	1

Total ... 24

TABLE D.
February 12, 1912.

No disease	...	...	...	1
Scarlet fever	...	...	...	3
Varicella	...	...	...	2
Pertussis	...	...	...	2
? Scarlet fever	...	...	...	2
Diphtheria	...	...	...	2
Erysipelas	...	...	...	11
Cellulitis	...	...	...	1
Measles	...	...	...	2
Diphtheria and measles	...	...	...	1
? Diphtheria	...	...	...	1
Measles and pertussis	...	...	...	1

Total ... 29

It will be observed that cases of erysipelas, occurring chiefly amongst adults, constitute a considerable proportion of those treated. It has been our practice to accept no unnecessary risks, and the high percentage of adults admitted has been utilized where possible in the separation of prime [infections occurring amongst children. A closer examination of Table D will demonstrate the advantage which we have enjoyed in this respect. The diseases mentioned in this table were distributed in accordance with the following chart (fig. 2). Although several of these patients were in the acute stage of their illness, no instance of cross-infection occurred.

The following particulars concerning these cases (omitting erysipelas and cellulitis) may be of interest :—

(1) Sc. F. (side ward). A severe septic type of disease. This case was subsequently moved to the main ward for better observation.

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disposal, but I anticipate that the proportion for measles is less than the above. Certainly a complicating outbreak of measles in a hospital ward is more easily brought under control in this city than in London. The converse is probably true of chicken-pox.

I will refer, if you will allow me, to one or two practical and theoretical considerations which have been suggested to me by critics, or by my own experience of the working of this system.

The evidence in favour of, and against, aerial infection is of too complex a character for adequate discussion in this paper. A brief survey of recent experimental research cannot fail to impress one with the extreme divergence of views arrived at by observers of equal merit, and I am inclined to believe that the experiments of Cornet [2], Lobstein [6], and others are conducted under conditions too far removed from the natural to be of value in determining the common methods of infection in humans.

But few of my critics have spared me the *Bacillus prodigiosus* investigations of Flüge [4] and Hübner, and I submit to you that these experiments totally disregard the considerations of dosage and virulence essential to our subject. The quantitative studies of Winslow and Robinson [8] are of greater interest, but here again we are without information as to virulence, and we have no means of gauging the hostile influence of the tissues of the human body.

It is universally admitted that the specific organisms of diphtheria and tuberculosis are commonly transmitted to the walls and furniture of wards inhabited by their hosts, but it no longer occasions surprise that their attendants, visitors and relatives escape infection. The bacteria of suppuration have been found without difficulty by Robb [7], Harrington [5] and others in the atmosphere, and on the walls, of operating theatres, but the precautions of Lister have been in practice very largely superseded by measures directed against contact infection. Surgeons pay little regard to the risks of aerial infection, although pus-forming bacteria are the most ubiquitous of pathogenic organisms to be found in the atmosphere. In the present state of our knowledge it is not possible to explain these discrepancies between the results of practice and experimental research. Epidemiologists are commonly agreed that aerial transmission is more likely to occur in the case of variola or varicella than with other infections. We have not yet included the former disease in our system, but our experience in regard to varicella justifies a closer examination.

Briefly, forty-one cases of varicella have received treatment in our

bed isolation ward; no instance of cross-infection occurred. On the other hand, varicella has been accidentally introduced into the ordinary wards of the hospital on twenty-one occasions, during the same period of time; cross-infection occurred in every instance excepting one. Precisely the same opportunities for aerial infection were present in each group of cases. How, then, are we to explain the striking difference in the results obtained, except on the grounds that contact infection was excluded in one series of cases only? All stages of the disease and all grades of severity have been represented in the forty-one cases mentioned, in fact more than one of them were, from the confluent character of their eruption, sent to the hospital on a mistaken diagnosis of small-pox.

Two facts more than any other are advanced in support of the infectivity of the inspissated scales in the case of variola and varicella (assuming these diseases to be associated with allied organisms). Firstly, the successful practice of inoculation of small-pox by scabs, and secondly, the maintained virulence of dried vaccine lymph. If we accept these facts without regard to the limitations of dosage, &c., to which I have previously referred, then the aerial transmission of these infections should be readily possible and the immunity our patients have enjoyed becomes difficult to explain. May I recall to you, on the other hand, a circumstance which has seemed to me to go far to disprove this theory—viz., the absence of return cases of variola and varicella in hospital practice. It may, I think, be fairly argued that were the infectivity of the scales in these diseases a considerable factor, return cases should be by no means infrequent in the stress of epidemics, whereas, in actual fact, it seems questionable whether a true return case has ever been clearly demonstrated in respect of either disease.

It has been thought that the system of bed isolation presents possible sources of danger, other than contact infection, which are beyond control administratively. Chief of these has been held to be the risk attendant upon either mild and unrecognized attacks of infectious disease, or true carriers, occurring amongst the staff. Our experience leads us to believe, however, that the measures of asepsis adopted are equally protective to staff and patients. Fifty-five members of the nursing staff have been employed in this work, of whom only one developed an infectious disease. This incidence is probably considerably less than that met with in fever wards generally, and we are justified in supposing that "carriers" and unrecognized cases are proportionately infrequent.

A greater danger perhaps is to be found in the possible transmission of infection by flies. The experiments of Spillman and André [1] have demonstrated that bacteria may be carried on the bodies of insects, and, on occasions, passed through their stomach in the living state. It would seem that this factor is only important in the case of faecal-borne diseases, but I confess to some anxiety in this respect during the summer months. The usual preventive measures for the suppression of this nuisance have been freely employed, and I am inclined to think that flies do not often pass from bed to bed when they are offered an easy exit through an open window.

There are one or two questions of administrative detail to which I would refer very briefly.

We make no attempt to disinfect the nose or throat by the use of antiseptics, nor do we apply oils to the skin except for the prevention of scarring. In this respect our system differs widely from the procedure laid down by Dr. Crookshank [3] in a recent paper to this Section. Further, the number of articles retained for the use of individual patients is reduced to a minimum. Feeding and other utensils are, wherever possible, taken from a common stock, and sterilized after use. Dr. Crookshank emphasized the importance of strict adherence to his ritual in all stages of the prime infections, that is, in intensive and recessive stages. We have not regarded this as necessary, or even desirable, and have commonly under observation in our bed isolation ward a group of neutrals, the individuals of which utilize, for instance, the same chairs and lavatory accommodation, and dine at the same table.

The members of our nursing staff are given to understand that an instance of cross-infection is to be regarded by them as a catastrophe for which they are collectively and individually responsible. Thorough washing of the hands is held to be of greater importance than the combined effect of other measures. I think it not improbable that where running taps are provided at each bedside, as in the glass cubicle system, there is danger of hand-washing becoming hasty and perfunctory. This risk is, in our system, obviated by the provision of hand basins in the centre of the ward to which the nurse has to refer deliberately, and under the critical observation of those in charge. The wearing of a cloak is probably of little direct value except in the treatment of septic cases of scarlet fever; this practice is retained as necessitating a delay during which the nurse has time to think, rather than as a direct barrier to the spread of infection.

If it be accepted that this system offers sufficient security to justify its further adoption, it remains to consider its limitations. The controlling factor is undoubtedly that of adequate nursing with intelligent supervision on the part of the medical officer directly responsible for the ward in question, and those of us who have the administrative control of large institutions will realize that only a fraction of our staff can be relied upon to fulfil these conditions. It may be hoped with some confidence that the educative influence of the system of individual isolation will eventually improve our position in this respect; but for the moment it seems questionable whether more than a proportion only of our wards can be safely utilized in this work. Again, are we to accept instances of all the prime infections for treatment in our bed isolation ward, or is our list to be a provisional and diminishing one? The figures already quoted indicate that we have not lacked courage in this respect. I am informed that small-pox would afford a test of infinite value. We are constrained by considerations of which I need not remind you. It may, notwithstanding, be of interest to note that at Fazakerley cases of small-pox, when few in number, have been treated without ill results in a ward in series with the general wards of the hospital, and under the same central administration.

The isolation of septic scarlet fever by this method presents difficulties of an exceptional character. The system requires that all patients suffering from complications of an infectious nature shall be detained in bed. In the case of scarlet fever with septic sequelæ this period of bed detention would be sufficiently long to prejudice the patient's recovery. A breach of our regulations in this respect was responsible for one of the instances of cross-infection already mentioned, and we no longer treat cases of this character in our bed isolation ward. Cases of scarlet fever with no secondary complications can, however, be safely dealt with by this method. Further, all cases of this disease classified as "doubtful" on admission are sent direct to our bed isolation ward, and I would remind you of the view so ably expressed by Dr. Crookshank [3] "that cases are not necessarily infectious in proportion to their severity, and that the early atypical intensifying cases are probably those in which the virus has the highest infective potency."

The only other disease requiring mention is whooping-cough. There is here, I think, no danger of cross-infection, but the nature of the paroxysms is somewhat disconcerting to adult patients and their friends. We continue to treat cases of this description by our system. Thus, of all the common prime infections, septic scarlet fever would appear to be

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the sole condition which cannot be adequately dealt with by the method of bed isolation.

It forms no part of my paper to postulate the effects on sanitary measures which may result from a modification of our views as to the transmission of infection. I think, however, that by far the most significant feature of our results is the fact that 214 patients, suffering from no infectious disease, received treatment in the same ward, and at the hands of the same nurses, as 527 patients suffering from one or more of the prime infections. These 214 "negative" patients were, in the majority of instances, of susceptible age. It may be presumed that many of them were, from the nature of their illness, of lowered resistance. In no instance was an infectious disease contracted. A consideration of these facts lends support to those hygienists who believe that preventive measures should be directed towards the supervision of "contacts" and "carriers" rather than the disinfection of dwellings.

In conclusion, I have to express my indebtedness to Dr. E. W. Hope, for the support which he has given me in this work. The views of Dr. Hope on the subject of aerial infection are well known to this Society. Dr. Burton, my Senior Assistant Medical Officer, has been largely responsible for the details of ward administration; without his assistance this investigation would not have been possible.

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DISCUSSION.

The CHAIRMAN (Sir Shirley Murphy) said the paper was a most interesting and entertaining one, and he had seldom heard one which more invited discussion. It was well worth raising questions as to the way in which these results had been attained, and how far those results differed from those which used to be achieved in the old days when infectious cases were treated with others in general hospitals.

Dr. F. THOMSON said he had listened to the paper with the greatest interest, and he would compliment the author not only on the results he had obtained, but upon the amount of courage he had displayed in the matter. He had

himself taken a close interest in the subject, and since he heard of Dr. Rundle's results he had started a ward on somewhat similar lines. For three years he had discussed the question with his assistant medical officers, and felt he would like to take one of his cubicle wards, which contained doubtful cases of scarlet fever, and of scarlet fever and diphtheria, and sometimes whooping-cough, and put them into a ward such as Dr. Rundle's and treat them on the bed isolation method; but his courage had always failed him until he heard of Dr. Rundle's results. But he had never dreamed of putting chicken-pox into such a ward, because he considered that to be aerially conveyed; until he heard what Dr. Rundle had been doing he did not care to go too far. He emptied one of his cubicle wards into a ward in which he proceeded to carry out bed isolation. The patients at first admitted to this ward consisted of six negative cases certified as suffering from scarlet fever or diphtheria but not actually subjects of either disease; one of diphtheria and vaginal discharge, one of scarlet fever and diphtheria, and another of diphtheria only. He admitted no more patients into the ward for a week in order to give the nurses an opportunity to get accustomed to the ward routine, &c.; then the sister said she could take anything, and she believed she could do what they were doing at Dr. Rundle's hospital, and that encouraged him.

Then he proceeded to differ from Dr. Rundle in his method; he purposely avoided putting in adults. He realized it was wise of Dr. Rundle to put in adults, because that lessened the chances of infection; but he thought that if the scheme were going to be tested in London it should be carried further, and accordingly he admitted only children into the ward; also the cases were all selected, they were the most infectious cases in the hospital. They were all children, except one, aged 16. So far, he had only treated twenty-four cases in that ward, and eighteen of those were under 6, and therefore at the most susceptible age. The following cases were treated in the ward: four scarlet fever, one scarlet fever and diphtheria and vaginal disease, three of scarlet fever and whooping-cough, two scarlet fever and chicken-pox, one diphtheria and vaginal discharge, one whooping-cough and chicken-pox, one German measles, one mumps, one pneumonia, one mastoiditis, two tonsillitis, and six no obvious disease. The ages were, under 1 year, one; between 1 and 2, one; between 2 and 3, four; between 3 and 4, four; between 4 and 5, five; between 5 and 6, three; between 6 and 7, one; between 7 and 8, two; between 8 and 9, one; one aged 12, and one, which was there three or four days, aged 16. He only put one case of chicken-pox into the ward at a time, and then waited until he thought there was no further danger from that. Then he put another case in, later a third. No result occurred from the first two cases, but there was a result from the third, for two patients were infected and they were on the other side of the ward. He put no adults between the patients, but next to the chicken-pox case he put a patient who showed the scars of chicken-pox, so that the disease existed in the case at one time. There was great distress occasioned by this occurrence; the staff had by this time concluded that the system was working satisfactorily. He (the speaker), however, felt certain that

Dr. Rundle was right, and he still thought so. He was firmly of the opinion that the infection was due to the coal strike, and in this way. The managers of the Asylums Board were afraid that they were going to run short of coal, though he believed that the hospitals were really well provided. But he had to discontinue the hot-water supply, so that the nurses could not cleanse their hands in hot water, and as there was a cold spell they got chapped hands, and could not keep their hands clean. Of course, there were other sides to the question. At the time the infection occurred there was a westerly wind, and the infection occurred in cases on the east side of the ward. With regard to the nursing, the first case of chicken-pox he put on practically special nursing. He did not put on a special nurse for the whole of the day, but one nurse attended all the morning up till dinner time, and no other nurse went to the patient, and then after dinner she might be put on to other work, and another nurse was put on to the case. But the second case was treated like the others in the ward, and the third was attended by all the staff, except one member, a junior, who had not got chapped hands. He was sorry that had happened, but it had not shaken his confidence in the treatment at all. His experience of the method had been very limited, but he felt that he must relate those facts.

He wished to ask one or two questions, as he was only starting the plan, and did not know much about it. First, how did the author arrange about the relieving of his nurses? That had always been a difficulty with himself in his cubicle and box wards. At present his ward was being run without regard to expense; he put in five day nurses and two night nurses; he kept a specially trained nurse to relieve the night nurses, and the day nurses relieved themselves. That was because he wished to do all he could in the matter. Also, was the bed-making and bathing done by the night nurses, or by the day nurses? It was very important to have the bed-making under control, and in his institution the bed-making and bathing were done by the day nurses. Dr. Rundle seemed to hesitate about the desirability of the nurses wearing cloaks. He (the speaker) thought that, except in very infectious cases, the wearing of a cloak was of no use at all. In his cubicle work he gave up that years ago, and it made no difference. Perhaps it was wiser to wear cloaks in cases of chicken-pox at first, but he proposed to give it up in those cases before long. The nurses' arms were bare to the elbows, and when they went into the ward they put on a cloak that fitted closely over the uniform. It was taken off when the nurse went to meals, and was washed every day; that precaution prevented any infection hanging about her for any length of time. Another point was, that he felt when he opened the special ward that the abolition of books, papers and toys was a serious matter, and it was difficult to know what to do. Some people advocated tying the toys to the bedstead, but they could easily become detached and infection occur in other patients. When he disallowed toys or books in the ward he expected to find the children miserable, but he considered the ward the happiest in the hospital. The nurses were so busy in the ward that the children were constantly interested. He also used lysol for disinfecting the hands of the nurses, and he used that because Dr. Rundle did. His own choice was to use only soap and water. He asked Dr. Rundle whether the use

of disinfectants might not possibly add to the danger of chapped hands and so be a bad thing. He had not put a case of measles into his ward, but he did not think measles was nearly so infectious as chicken-pox. But he felt that if he were to put a case of measles in and a disaster happened and the child died, he would not be able to explain his position to the parents if they took up a hostile attitude about the system. He believed measles ceased to be infectious after three or four days if the patient did not get bronchitis or bronchopneumonia. He asked how many cases of measles were admitted on the first day of their rash or prior to it—i.e., not later than the first day.

Another difference in his ward was that he did not allow the patient up, as Dr. Rundle did; the author's two infections were only after the patients got up, and they were both scarlet fever, which infection sometimes persisted for months. If patients in a ward of that sort were allowed up, as soon as a nurse's back was turned one might go to a chicken-pox patient in bed, and the sister of the ward said she could not take that responsibility; she feared children running across to other patients in bed. He thought that too much importance had been attached to the late scabbing in chicken-pox and small-pox; he had seen children in the late scabbing stage of chicken-pox, when they had a fair number of scabs left about the head, put back into their original wards in which there were susceptible children, and no evil resulted. In the 1901-2 epidemic of London he discharged hundreds of patients while they were thickly scabbing on the feet, that being a necessity because he had either to refuse the admission of patients into the hospital, or discharge those scabbing cases. He adopted what he considered the more desirable course for the public safety, and he did not hear of any return cases. If there had been such he felt sure he would have known of them, as there was no reticence in the matter of complaints from medical officers of health when there was any cause.

Dr. Rundle suggested that the system of bed isolation was protective to the staff, but he (Dr. F. Thomson) did not think the author's evidence of that sufficient. The experience was too limited, especially having regard to the fact that a large staff might for a long period contract but few infections. In his own hospital in 1910 there were not many of the staff who had infectious diseases. The nursing staff in the hospital numbered 178. Two of them got diphtheria and one whooping-cough. He would be glad to hear whether Dr. Rundle disinfected the doctor's stethoscopes, and if so how he did it; also the penholders which the doctor used. He differed from Dr. Rundle as to the importance of running taps; he believed that running water was best to use, and that bacteriologists would agree with that. He doubted the advantage of washing the hands with deliberation, and thought it was perhaps safer for the nurses to wash their hands from habit. Some people considered that the new system of bed isolation would accomplish all sorts of things at once, and that it was not necessary to build isolation wards, but he thought that was a mistake. It would require years to settle the question, not only if Dr. Rundle's figures could be supported, but whether the system would be economical from the administrative point of view. It was a question whether this method would not prove more expensive than that of the usual isolation wards.

Dr. F. G. CROOKSHANK said he had come really to listen, as he was not now in charge of an isolation hospital. With regard to a remark of Dr. Thomson, he could give no information as to the probable cost of nursing in a large hospital, but he would point out, as he had done before, that in small hospitals there must be considerable saving in the cost of nursing, because in a small hospital, where there were six or twelve beds in each ward, and it had been the custom to keep up at least two separate staffs of nurses, one for scarlet fever and one for diphtheria, these staffs could be amalgamated. At Mortlake Hospital, from 1907 to 1911, he arranged for the nurses in the block which was nominally set apart for scarlet fever to relieve others, and vice versa. So that instead of having sometimes to put on two diphtheria nurses, and one scarlet fever nurse, there would be only two, and they used to interchange, and help each other as occasion required. In that way considerably fewer nurses were on duty throughout the year. With regard to Dr. Rundle's paper, he was very interested to see the excellent results. The only real difference between his method and Dr. Rundle's was the treatment of the throat in diphtheria and scarlet fever cases. Certainly he understood that Dr. Rundle did not deal out a thermometer, and so forth, to every patient separately, but he (the speaker) did that at Mortlake, and he preferred that, because there was then less danger of accident. But these were not points on which one could erect any fundamental distinction. But the treatment of the throat was an important matter. It was true that Dr. Rundle's results had been almost perfect, without doing anything to the throat; but his own results were at least as good with treatment of the throat, and such treatment seemed to provide a safeguard. He did not say that an ideal method of treating the throat had yet been arrived at, but attacking the nose and throat lessened the chance of a breakdown in the bed isolation, for infection did remain in the throat in a certain number of cases. With regard to aerial dissemination of infection, he thought very little of the possibility of aerial infection from one end of a ward to the other in the case of scarlet fever. But if a person suffering from scarlet fever had a certain number of objects in his vicinity, those objects were apt to be infected by droplets from the mouth and throat; and if those objects were carried from one patient to another, infection was likely to occur. The method which he had found most satisfactory was spraying with oily solution, in favour of which there were a number of sound scientific reasons. The spraying resulted in a very high degree of atomization, and the material passed into all the nooks and crannies of the mouth and throat, &c. Moreover, there was sound bacteriological justification for the method; it was a commonplace method in bacteriological laboratories to attenuate the virulence of an organism by encapsulating with a film of oil. And if at the same time one used such a preparation as *izal* there was further advantage. The most damaging criticism against the bed-isolation method was Dr. Rundle's suggestion that if it failed at all it failed in the case of septic scarlet fever. Dr. Rundle said that in the case of septic scarlet fever it presented exceptional difficulties; but he was not sure whether

the author meant that difficulties arose *qua* scarlet fever or *qua* the septic condition of scarlet fever. Any way, he (Dr. Crookshank) had had the greatest success in dealing with septic scarlet fever, and it was that success in early days which gave him confidence to go on. And he still adhered to his point that in septic scarlet fever a certain amount of good was achieved by treating the throats in the way he had suggested, and also by swabbing the fauces with pure iodozinc. He always did that personally, and did not entrust it to the nurses. Afterwards he kept up the spraying, and it was remarkable how quickly the cases improved. If one saved only three or four days in the infectivity of septic scarlet fever, much was gained. Another point was that in some respects the experiments at Mortlake were more stringent than were Dr. Rundle's, because the latter's cases were diluted down to a considerable extent. Out of 600 cases, 233 were cases of erysipelas, and there were only 120 cases of scarlet fever and diphtheria. He did not suggest that the cases were intentionally diluted down. But in his own cases there was a very much higher proportion of scarlet fever and diphtheria, and, of course, a smaller proportion of the other diseases. A crucial experiment which was always turning up was when they had a twelve-bed ward block, nearly full with scarlet fever, and a case of diphtheria, or a case of tonsillitis, got in and yet escaped infection. If one child placed among ten cases of scarlet fever escaped the latter disease, it seemed to be a fairly severe test of the efficacy of the method. It was, *qua* scarlet fever, the converse of the test obtaining, when one case of scarlet fever got into a ward containing mixed cases of other diseases.

Dr. CHALMERS said he thought that Dr. Thomson himself offered a criticism on his own earlier remarks, and he also answered to some extent a query which he (the speaker) had had in his mind as to what would be the cost of the method if it required five nurses to look after twelve patients. An incident occurred, which was perhaps within the recollection of all those present, in which there had been indiscriminate mixing of a large infected population under Dr. Priestley's notice some years ago when small-pox appeared in Leicester. Dr. Priestley promptly emptied his scarlet fever wards so as to make room for small-pox cases, and he believed that he had done so without risk to the population, because the prevalence of scarlet fever in the population at the time was uninfluenced. If that were true under all conditions, and particularly if there were a falling rate of scarlet fever after dismissal, the best thing during the rise of a scarlet fever epidemic would be to empty the scarlet fever hospitals. But he asked whether, if the experiment had been carried out during the seasonal rise in scarlet fever, its infectivity would not have been better illustrated. The same criticism applied to the work being done in connexion with bed isolation; the period of rising prevalence should be selected. Those who had dealt with small-pox on a large scale knew that at "off-season" times secondary infections failed to occur from admixtures which did occur at other times when the seasonal conditions differed. Cubicle wards had been used in Glasgow, and as Dr. Thomson said,

varicella and hyperæmic measles were two diseases which they regarded with apprehension. He heartily congratulated Dr. Rundle on the importance of his experiments.

Dr. BUCHANAN desired to join with other speakers in expressing his appreciation of the great value of observations which Dr. Rundle had reported, also of those contributed by Dr. Thomson. He hoped that there would be a continuation of these observations on a considerable scale, and that the material would embrace all the details which were so necessary in order to arrive at a proper apprehension of their bearing. It was particularly appropriate that the communication should have been read before the Epidemiological Section, because of the desirability of looking at these considerations from the standpoint of epidemiology. For example, there was the elementary epidemiological fact that infectious diseases differed materially in their natural history and in their mode of spread; each disease had its own features in those respects. Although certain things were common to all infectious diseases, it was very dangerous to generalize about methods of spread of infection. For instance, it would be useless to talk about water-carriage of infectious disease as a whole, merely on the evidence that the majority of infectious diseases bore no relation to drinking water. The same could be said of aerial convection. It was necessary to consider the results obtained by Dr. Rundle in relation to the known epidemiological facts concerning each disease, and to think of how those facts fitted in with what was known already. Much of what Dr. Rundle put forward accorded with common experience if one went back to the earlier days before isolation was carried to its present stage. He did not think that air infection had been supposed to play any part in the carriage of infection from diphtheria or enteric fever. It was true that in isolation hospitals as now established it was customary, from administrative and other reasons, to treat infectious diseases very much on the same lines in regard to their assumed potential infectivity; but the practice up to recent years in the general hospitals of London was to treat enteric fever and diphtheria in the ordinary wards, without any consideration of the risks of spread to neighbouring beds. And it very seldom did spread, when there were no such precautions taken as had now been mentioned. It was different with diseases like measles, varicella and whooping-cough. It was generally thought that measles and the diseases which had an acute catarrhal stage and were known to be specially infective at particular times, were infectious by reason of the particles which were disseminated by the act of sneezing and coughing, and that air-currents were capable of conveying about a house or a hospital ward doses of infection sufficient in intensity to create the illness. Taking measles as an example, how far did Dr. Rundle's observations affect this view? Out of forty-two cases which had been dealt with, twenty-nine were convalescent on admission to the ward. Thirteen cases of measles in the earlier stage were admitted at different times into two wards, each ward containing twelve beds, but if one were to draw conclusions from the experience of these wards as to the ability or non-ability of measles to be spread by air-

currents, it was necessary to know more facts than had been supplied in the paper. It would be well to know if there was any possibility of patients having developed measles after leaving the hospital. On page 174 Dr. Rundle said, "During the two years under review the number of patients who developed an infectious disease whilst under treatment was two," and then later he said, "None of these contracted any infectious disease while in the ward." He thought the author should say whether these cases were specially watched after they went out. That was a material point, because measles and chicken-pox were non-notifiable, and if they occurred outside they might not be heard of. Dr. Thomson raised the question as to the stage at which the measles cases were admitted. The only cases specifically mentioned in the paper were one case on the second day of the eruption, and one case on the third day of the eruption, in series D. That tended to eliminate the earliest or most infective stage. Then there was the question of how many cases there were in the particular ward at the time when acute measles was present; it was necessary to know what their ages were, and anything which might indicate the probability of their having had measles already. There was a further important point which applied to all these diseases, namely, the desirability of knowing what was the behaviour of the individual diseases as a whole in the town at the time; for instance, in measles one wanted not only to know that it was February, and therefore a time when measles might be supposed to be prevalent, but whether the curve of the disease was actually rising in Liverpool at the time when acute cases were admitted into the ward along with susceptible people. Towards the end of an epidemic there might be free exposures of people and under conditions under which one would be confident of infection, but infection did not ensue.

With regard to varicella, on pages 178-9, Dr. Rundle said forty-one cases of varicella had received treatment in the isolation ward, and no instance of cross-infection occurred. "On the other hand, varicella has been accidentally introduced into the ordinary wards of the hospital on twenty-one occasions during the same period of time; cross-infection occurred in every instance excepting one. Precisely the same opportunities for aerial infection were present in each group of cases. How, then, are we to explain the striking difference in the results obtained, except on the grounds that contact infection was excluded in one series of cases only?" This conclusion might be strengthened if the circumstances of the two cases were fully stated. For example, if the varicella cases in the other wards—non-isolation wards—had come in a group and the others had been scattered over two years, or if the susceptibles were present in different proportions, it would make all the difference. Perhaps when Dr. Rundle had an opportunity of supplementing his paper he would put those facts on record. With regard to small-pox, cases of that disease had not been tried, and for obvious reasons: and one wished it could be tried under conditions on which it would be practicable to test the question. It was necessary to look at this matter also from the point of view of epidemiology. The notion which seemed to be conveyed in the paper,

that small-pox was most infective in the stage of convalescence and scabbing, he considered to be unsupported by evidence of anybody who had had experience of small-pox. With regard to aerial infectivity, small-pox stood apart, because the evidence of aerial convection of infection was not based merely on the transmission of infection within a house or hospital ward, but on the influence of the small-pox hospital on surrounding populations, which was exerted in a characteristic way not shown by any other infectious disease. This was fully brought out before the Epidemiological Society in the 1904-5 volume. This evidence from small-pox hospitals had relation to the acute stage of the disease, in the rise of the epidemic. There had been opportunities of testing in convalescent small-pox to see if there was anything of the same kind, but the result was negative. If at any time it should be possible for Dr. Rundle to test the aerial carriage of small-pox infection in bed isolation wards—if he could get sufficient unvaccinated persons to volunteer to sleep in isolation wards with small-pox cases—it would be necessary to take acute small-pox cases in the rising period of the epidemic. That would perhaps be an unsatisfactory test for the nurses. The author said, "The members of our nursing staff are given to understand that an instance of cross-infection is to be regarded by them as a catastrophe for which they are collectively and individually responsible." He would be sorry to be a small-pox nurse under Dr. Rundle's régime under the circumstances mentioned.

With regard to ventilation, Dr. Rundle said something about that at the commencement, and it would be well for those remarks to be incorporated in the paper, or in any subsequent communication, because it was very important that one should know what the degree of aerial dilution was normally in the bed isolation wards and what sort of convection currents would be formed. When a cross-infection occurred, as in the case of chicken-pox, one must balance between the probability that it was occasioned by an aerial current, notwithstanding the dilution and diffusion due to the abundant ventilation, or was to be attributed to some special cause, such as the penholder or the coal strike to which Dr. Thomson had referred. Now that experiments were being done, he would like to see the results, over sufficient periods, of differential experiments on the ventilation of a bed isolation ward. One could try, first of all, having all the windows usually shut at the bottom, then gradually work up to having all windows usually shut at the top also, and see whether infection then passed from one end of the ward to the other. If no cross-infection was found then the epidemiologist would feel on much surer ground in denying that air-currents could play a part in disseminating diseases like acute measles or varicella in an exceptionally well ventilated ward.

His remarks had been of a critical nature, because he was anxious that the epidemiological factor should be fully taken into account, and thought criticism would be useful in providing further points for future investigations, which all members of the Section naturally hoped would be made.

(The discussion was adjourned until May 31).

Epidemiological Section.

May 31, 1912.

DR. THEODORE THOMSON, C.M.G., President of the Section, in
the Chair.

Discussion on Dr. Rundle's Paper: "The Bed Isolation of Cases of Infectious Disease."¹

DR. E. W. GOODALL said that he had listened to the communication with the most intense interest. He had previously read the paper by Dr. Rundle and Dr. Burton, which appeared in the *Lancet* of a few weeks previously.² There were several points in that paper which, it seemed to him, required clearing up, and had he not been aware that Dr. Rundle intended to present his results to the Section, he would probably have been the means of inviting him to further debate. The paper read before the Section was somewhat fuller of detail than that published in the *Lancet*, but there were one or two points upon which he desired a little more information. In the first table on page 175 it was stated that 76 cases of scarlet fever were treated in this pavilion. But previously, on page 172, in the detailed list of the diseases admitted, no mention was made of scarlet fever cases, save such as were doubtful on admission. He took it, therefore, that the cases of scarlet fever in the table were those that were doubtful at first and were diagnosed as scarlet fever only after a longer or shorter stay in the ward. He would like to be certain whether this was so or not. In his experience most of the doubtful cases of this disease were at the present time very mild cases, and with all deference to the opinion of Dr. Rundle and Dr. Crookshank, as quoted on page 181, though cases of any disease were not necessarily infective in proportion to their severity, yet he was of the belief that usually such was the case. At all events, that was his experience, especially as regarded scarlet fever, at Homerton. He also wished to ask what number of cases, more especially of the infectious diseases, proved fatal. This bore upon the point he had just raised. His last question related to a remark to be found on page 179. Were the cases of varicella which were accidentally introduced into the ordinary wards of the hospital removed directly

¹ Adjourned from April 26.

² *Lancet*, 1912, i, p. 720.

they were discovered, or were they allowed to remain in the wards? He then turned to a discussion of one or two of the wider questions which were raised by the paper. The first was the hypothesis of aerial convection considered in relation to the isolation of single cases of the acute infectious diseases. He did not intend to enter into any question as to the origin of the doctrine that infection was, to all intents and purposes, never conveyed save for a short distance through the air. He believed he was correct in stating that it sprang from a school of French physicians. Professor Grancher wrote a paper on the subject certainly twelve years ago, and his experience went further back than that. It was true that in the system he tried there was partial separation of the patients by partitions between the beds, a method concerning which he would say something presently. To the best of his recollection, the writer just mentioned placed various infectious diseases, including measles and chicken-pox, in the same ward, and he failed, though perhaps not to such a degree as might have been expected, to prevent the spread of infection. He attributed his failure, not to aerial convection, but to certain deficiencies in the nursing staff. Those who were responsible for the design of the Pasteur Hospital in Paris were evidently not prepared to go as far as Grancher, for, as was well known, each patient in that hospital was completely separated from the others. From the point of view of bed isolation that arrangement would, he supposed, be regarded as a retrograde movement. But Dr. Rundle had reverted to the original French idea, had indeed gone beyond it by removing the partial physical barrier, and appeared to have succeeded where Grancher failed.

To return, however, to the question of aerial convection: the impression conveyed to the speaker's own mind by a perusal of the paper was that the author believed that what he (Dr. Goodall) might term the complete physical separation system—the system by which each patient was completely cut off from his neighbours by some kind of solid barrier—had been adopted by its advocates almost entirely, if not entirely, because they believed that aerial convection played an important part in the transmission of infection. He did not think that this was quite a just statement of the case of those who, like himself, had been believers in the complete separation system. Except in the case of small-pox under certain circumstances, and to a lesser degree in measles and whooping-cough, he could not admit that he had been an upholder of aerial convection. Why, then, it might be said, advocate the complete separation system? Because he had believed that, however trustworthy the staff might be, the patients could not be trusted; it was not possible to be certain, however vigilant the staff, that some infected articles might not find their way from one patient to another and so convey the infection. That Dr. Rundle had succeeded, almost completely, in preventing such occurrences was to his mind the most remarkable of his achievements. It was this fear of the accidental interchange of infected articles that chiefly led the speaker to advocate complete separation. He confessed that he had never been able to see the necessity of what he might for convenience, and with no intention of disrespect, call the half-and-half system, in which the patient was separated, but not

completely separated, from his neighbours by some kind of partial barrier. It had always appeared to him that the cases which were considered suitable for this treatment were just those which either required no separation at all, or at any rate no more than the "mark and keep separate" system, which used to be employed by the late Dr. Hopwood at the London Free Hospital when he (the speaker) was resident there twenty-five years ago. In this system everything used for or by the patient was marked by a label of some kind, so that it could be kept strictly for him. The nurses were enjoined to wash their hands after attending upon him, but india-rubber gloves were not worn. Dr. Hopwood employed this method chiefly for combined or apparently combined scarlet fever and diphtheria. When the speaker went to Homerton he tried it in more definite and varied cases. Sometimes it succeeded, sometimes it did not. But it was successful more often in a case of mixed scarlet fever and diphtheria in a scarlet fever ward than of mixed scarlet fever and diphtheria in a diphtheria ward. It was uncertain in the case of whooping-cough, hardly ever successful in the case of chicken-pox, and as for measles he confessed that he never had the courage to try it for that disease. But when a breakdown occurred it was very difficult to say whether the fault lay with the nurse, or the patient, or the air. Consequently, when he had been obliged, in his official capacity, to advise on the character of isolation accommodation, he had always been in favour of the complete separation system. When a breakdown occurred with that system, the staff, medical or nursing, and the staff alone, was to blame. But the cases dealt with in Dr. Hopwood's method were dotted about in different wards, and the risks of infection were increased when the total number of the separated cases was considered. But in Dr. Rundle's method, as the separated cases were in one or two wards, administrative control was much more efficiently exercised, and this was a very great improvement.

Another point touched on by Dr. Rundle was that of dosage. He stated that in certain experiments which were alluded to the question was ignored. Not only did the speaker agree with him with regard to experiments, but he thought that not a few who had had to do with the treatment of, or had written about, infectious diseases had also disregarded the point. The speaker drew attention to it in a paper he wrote five years previously. They had only indirect clinical evidence on the subject. For instance, how often they found that a child, admitted inadvertently to a scarlet fever ward though not the subject of that disease, did not fall with it until he had been three or four weeks or even longer in the ward. Before he was infected he must receive either a massive dose or a frequent repetition, within a comparatively short period, of small ones. And, rightly or wrongly, he had been accustomed mentally to associate the power of any organism to infect, not so much with the virulence of the organism as with the largeness of the dose—that is, the number of organisms attacking at once.

Another point of some importance had been alluded to by Dr. Buchanan—namely, the nature of the phase of their history through which the infectious

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diseases concerned were passing. Particular phases might last for several years, as in scarlet fever, or a few months, as in measles. In November, 1910, when the exceptionally severe epidemic of measles which visited London at that period was on the rise, a case of that disease was inadvertently admitted into a twenty-bed scarlet fever ward. It remained in the ward fifteen hours during the night. Nine children caught the disease straight away from that one case. A few weeks ago, at a time when measles in Hackney and the neighbouring districts was mild, another case was inadvertently admitted into a twenty-bed ward, full of children. It remained in the ward for about fifteen hours, yet not a single patient caught the disease.

It would be instructive to know something of the history of infectious diseases generally in Liverpool during the period Dr. Rundle had dealt with. Lastly, he wished to say a few words on the question as to how far this bed isolation was likely to be of general use. On looking through the list of cases he was struck with one or two points. One was that a large proportion of the cases were of diseases of which the striking distance of infectivity, to use a term employed by the believers in aerial convection, was not great. He referred to the puerperal fever, typhoid, rubella, and diphtheria cases. It was the successful treatment of the measles and chicken-pox cases that appealed to him rather more than those he had mentioned. Then, again, there was the small number of mixed infections—only nine out of 527 cases. These were the cases for which he had to find a considerable amount of accommodation at Homerton: in fact, out of 414 cases treated in the large ward which contained twenty rooms, arranged somewhat after the fashion of those in the Pasteur Hospital, 93 had been cases of mixed infection. He noticed that Dr. Rundle said (page 176) that it had been his practice to accept no unnecessary risks, and, as he understood, judiciously to mingle adults with children, and to sandwich a case of, say, chicken-pox between two patients who had had the disease. These were arrangements which he would find it exceedingly difficult to carry out at Homerton, save now and then. Dr. Rundle also said that he had gradually arrived at his present practice. Perhaps he might bring it to a still greater perfection. As the speaker had not tried his method he spoke with some reserve when he said that, in his opinion, it would be found to have its limits, quite apart from any question of the efficiency of the nursing staff. No doubt it would be the object of more than one member of the Section in the course of the next year or two to endeavour to ascertain what the limits were. In conclusion, he congratulated Dr. Rundle on the boldness of his experiment, the thoroughness with which he had carried it out, and the success to which he had attained.

Dr. JOHN MACCOMBIE said that he had had the pleasure of seeing Dr. Rundle's wards, and he was very much impressed with the results obtained by this method of grouping. It was something of a revelation to find cases of measles and chicken-pox treated, if not side by side, at least within measurable distance of each other and nursed by the same staff. Dr. Rundle in his paper had said with regard to chicken-pox that he oiled the lesions in order to prevent pitting.

He hardly gave chicken-pox a chance of spreading. The lesions were persistently oiled from the time the patient was admitted until every scab had come off the body. If he were not to oil the lesion he would find probably that it spread more or less consistently. The speaker felt sure that a much more important factor in connexion with Dr. Rundle's experiment was that it prevented the dust, the dry pus, &c., from being blown from the patient to other patients. His experiments at Fazakerley, where he had adults to act in a certain sense as "buffers," scarcely lent themselves to the conditions of the Metropolitan Asylums Board. In the Asylums Board hospitals the cases were practically all those of children, and very few adults were admitted. They would watch with great interest the experiments of Dr. Thomson at the North-Eastern Hospital in the treatment of patients who were practically all children, and whom it was thus impossible to separate by adults. How far it was possible to adopt Dr. Rundle's methods as a regulation means of isolating these patients remained to be seen from further experiments, but the speaker did not suppose for a moment, nor did he think that Dr. Rundle would claim, that the system would obviate the necessity of providing single bed isolation rooms for the separate treatment of single cases.

Lieut.-Col. A. M. DAVIES said that he was requested at the previous meeting to look up the subject of hospital contracted infection from the records of the Army Medical Department, and to see if there were any instances of spreading infection of scarlet fever or measles in hospitals abroad, where there might be somewhat less efficient nursing, or, rather, rougher conditions. He had looked over the records of thirty years from 1881 to 1911 and had found very few cases indeed. In 1893 there were fifteen cases of scarlet fever at Cairo, three of which occurred amongst patients in hospital. In one case the disease was supposed to have been contracted by a person while conveying a scarlet fever patient to the hospital. In 1896 there were eight cases of scarlet fever at Woolwich among patients who had been in hospital for a period varying from eight to ninety-five days. Their occurrence was attributed to insufficient isolation. There was an isolation block, but it did not give absolutely efficient isolation. It was thought at the time that the infection possibly spread by means of hospital utensils, but this was rather vague. A third instance occurred in 1909, when six cases of scarlet fever were recorded in Alexandria. These were cases of convalescents returning from the infected hospitals after measles. They were cured of measles and got scarlet fever in exchange. It was not possible altogether to exclude in these cases the factor of infected clothing. The allowance of space in Army hospitals in the ordinary wards, not infectious wards, was 82 superficial feet and 1,200 cubic feet, and the space between beds was 3 feet. In infection wards, of course, a larger space was allowed. The measurements in these wards were 110 superficial feet and 1,500 cubic feet, and the space between each bed was 5 feet. There were a great many instances on record of the spread of disease when the barracks were crowded, and this was naturally put down to contact infection, which might or might not have been

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the case. But it was noted that when the troops were thinned out, and the comparatively crowded condition no longer prevailed, the spread of infection declined. The only measles outbreaks on record were two; one on a transport from Brisbane to Durban, involving ninety-nine cases, and the other on a transport from Melbourne to Durban in the same year, involving forty-three cases. Of course, on board ship it was impossible to isolate properly any cases of that kind, either of measles or of scarlet fever. From the records as a whole during the last thirty years there was little to be gathered one way or the other.

Dr. F. FOORD CAIGER congratulated Dr. Rundle upon his excellent results. He was more particularly interested in Dr. Rundle's experience from the point of view of its bearing upon other systems of isolation based on "medical asepsis." Dr. Rundle claimed that he had succeeded with his bed isolation in doing all that the cubicle or barrier systems had accomplished. On the strength of that claim Dr. Rundle evidently regarded anything in the nature of a partition intervening between the beds as unnecessary, and it followed inferentially that aerial infection might be discounted. The speaker was unable to go with him this length, but to a large extent his own experience was in accord. With regard to the success Dr. Rundle had obtained in dealing with scarlet fever, in the cubicles in the speaker's own hospital, the South-Western, they had done just as well as under this new system. It was very dangerous to attempt to argue from statistics in a question of this sort, but, roughly speaking, the number of cases of apparently mild scarlet fever introduced into the wards at Fazakerley, excluding convalescents, was fifty-seven, spread over a period of two years, and there were two accidents; while at Stockwell in four years the number of cases of acute scarlet fever admitted into the cubicle wards was 451, and the number of "accidents" was but sixteen, although septic cases were not excluded. Dr. Rundle regarded his system as sufficient for diphtheria, whooping-cough, enteric fever, rubella, possibly mumps, and certain other conditions, a view with which for the most part Dr. Caiger felt disposed to concur, but he could not refrain from expressing his surprise at the success Dr. Rundle had obtained with chicken-pox and measles. The speaker's own experience of chicken-pox in cubicles had been the reverse of Dr. Rundle's, and he had on previous occasions published certain observations which did not by any means encourage the belief that aerial convection could be discounted. At his own hospital for a number of months they deliberately excluded from the cubicle wards cases of chicken-pox; then on the occurrence of a case in a child who had been admitted in the incubation stage it was retained as an experiment, and fourteen days afterwards three cases of chicken-pox occurred in cubicles which were separated by considerable intervals. The plan of not admitting chicken-pox was again followed, but some two years later a case of chicken-pox was placed in the ward, and on this occasion also on the fourteenth day two more cases made their appearance, and there had not been a single case in the interval. If the incidence of these secondary cases was to be explained on the assumption that infection had been conveyed by some object, animate or

inanimate, the nurses or the utensils, it was most extraordinary that a failure in nursing technique should have occurred simultaneously and immediately in three and in two instances respectively. The speaker strongly favoured the theory of the aerial method of spread in these instances. Further, if they were to assume that the infection was carried by an attendant or by some article used in common, it was a curious thing that these instances of infection should have occurred on both sides of the ward, the two sides being attended by different nurses. He gathered from what Dr. F. H. Thomson had to say from his admittedly short experience of the bed isolation method that he was inclined to believe it possessed the virtues which Dr. Rundle claimed for it. Dr. Thomson's experience of the method at the North-Eastern Hospital, however, had not been a very long one, and the speaker expressed some scepticism as to the likelihood of its success being permanent in the case of chicken-pox. The fact remained that in respect to chicken-pox its capacity to spread in a cubicle ward could not be limited even by the greatest care with regard to nursing. As to measles, the speaker had the same objection. He felt very strongly that the infection in measles must travel, in some instances at any rate, by means of aerial convection. It followed that partitions had their uses. If two people, one with measles and the other susceptible, sat on chairs opposite to each other and conversed at a distance of a yard, one was admittedly capable of infecting the other. By moving gradually farther apart a point must be reached at which it was no longer possible for the infection to be conveyed from one to the other. If there were interposed between the two persons something in the nature of a screen, the chance of infection must surely be diminished if the distance between them did not exceed the range of infection. On the whole question he confessed to doubt as to the safety of the method of bed isolation in certain cases, and expressed the hope that something more convincing in the shape of evidence would be forthcoming.

Dr. F. M. TURNER congratulated Dr. Rundle on his good results, and also on the clearness with which he tabulated them. Towards the end of his paper he had said that he was intentionally leaving out of consideration the effects that might follow the extension of the system. It would be well to devote a minute or two to that side of the subject, because it was of extreme interest to all those in charge of fever hospitals. As a scientific society they were, of course, primarily interested in the scientific question as to whether chicken-pox was or was not capable of being conveyed through the air. But to people in positions of responsibility, which was the case of most of those present that evening, it was not of less interest to know what practical conclusions should be drawn from a scientific doctrine, and whether it was established as a practicable system or safe to go upon at all. Dr. Thomson had already taken the practical step of imitating Dr. Rundle in one of his wards. The speaker did not feel exactly in a hurry to follow the example. The point he wished to ask Dr. Rundle to consider was this: He started this ward in consequence of an overflow from another, and it was in a sense an experiment. It was well to be somewhat shy of repeating an

experiment when one could not plead similar pressure. But there was a problem which forced their hands, and which belonged to the region of scientific observation rather than that of experiment. In all Asylums Board hospitals these diseases would go on spreading from time to time, even under present conditions. Could they, by adopting any other method, reduce the incidence of infectious disease? Dr. Sweeting had put down the incidence of secondary disease in hospitals at 8 per cent., and although later statistics were somewhat below that figure, it was still very high indeed. A number of such cases, however, seemed to be of a very mild order, and in many instances they seemed to be getting the better of them. But he still found little short of 2 per cent. of scarlet fever cases being subject to diphtheria, and the highest figures for scarlet fever contracted in the diphtheria ward ran to 4.5 per cent. If any methods of careful supervision would prevent these diseases spreading when mixed up in Dr. Rundle's special observation ward, could these methods be made applicable to the ordinary wards of a large hospital? In one paragraph Dr. Rundle mentioned the contrast between the spread of chicken-pox in his ordinary wards and the absence of spread in his special ward. But were the methods of the special ward suitable for imitation in all the other wards of the hospital, or was the method dependent upon the peculiar reliability or conscientiousness of certain individuals? If the main factor to be taken into account was the particular virtue of one or two individuals, he thought it was the duty of the managers of fever hospitals to offer very high salaries in order to secure such competence.

Dr. WILLIAM BUTLER said that it was always stimulating when anyone came forward with a challenge to the orthodox methods of treatment, or to the prevailing views on a subject. On that ground they all felt indebted to Dr. Rundle. He did not know, however, that there was adequate ground for tendering congratulations upon results which he was not clear had been established so as to demonstrate the truth of Dr. Rundle's main contention. On looking critically at the figures Dr. Rundle had presented, one was left in considerable doubt. In the absence of knowledge as to definite specific exposures made in respect of each disease, it was not possible to say how far reliance might be placed upon bed isolation. With regard to scarlet fever and diphtheria, it would not astonish any member of the Epidemiological Section that these diseases had not spread under the conditions described. It was only comparatively recently that diphtheria ceased to be treated in the general wards of hospitals, and as to scarlet fever they had repeatedly had evidence that under ordinary circumstances it was a disease of very low infectivity. They had had it stated that the use of eucalyptus was sufficient to enable scarlet fever children to mix with healthy children, though this was probably only additional evidence that scarlet fever was a very much less infectious disease than they had been in the habit of supposing, and certainly one was not surprised to find that in the cases brought forward scarlet fever had not spread. The most striking fact in Dr. Rundle's paper was that measles, chicken-pox and whooping-cough had been treated in the wards without spread. After deducting the convalescents

and transfers, however, one was left with something like seventy cases of disease which one would expect to spread if reliance were placed upon bed isolation alone, and they were kept in a ward with other susceptible persons. But in looking at the tables he found that cases of carcinoma, erysipelas, tuberculosis, and other diseases of adults constituted a considerable proportion of the cases admitted to the wards, and in the absence of information, it was quite conceivable that the persons exposed to the diseases in the ward were insusceptible either on account of age or as a result of previous attack. It was really necessary to know the age-distribution of the patients simultaneously present in the wards with cases of these more highly infectious disorders, and whether a reasonable susceptibility could be granted to them. With these considerations still untouched, it seemed to him that judgment must be suspended as to the feasibility of relying upon this method of isolation. It was essential that they should know what were the specific risks before they could say that bed isolation alone was sufficient in these particular diseases.

Dr. E. C. BOUSFIELD said that he was intensely interested in this subject, and it was his good fortune to be associated with Dr. Goodall in the board-room of the Homerton Fever Hospital, where they had isolation the most perfect in England, and perhaps, in the world, and where nothing that Dr. Goodall's skill and experience could suggest had been neglected. It was again of special interest to him from the point of view of his connexion with the Metropolitan Asylums Board, because they had necessarily to consider the question of extending the isolation accommodation at their hospitals, and in view of Dr. Rundle's results they were asked by the Local Government Board to consider the alternative of "barrier nursing." Therefore, he had listened with extreme care to Dr. Rundle's paper and to the discussion which had followed it. His feelings were best expressed by the words, *Cui bono?* He was not led by his experience in connexion with fever to believe at any rate that there was any superiority in actual working, or any saving in the amount of work which was thrown upon the nursing staff, or any reduction in the actual number of nurses required as against the number required with the cubicle system. That being so, he did not see that Dr. Rundle could make any claim for his system other than that it saved the capital expense involved in the erection of isolation wards. The question, then, was: Shall we build cubicles, or are we justified in asking our medical superintendents to follow Dr. Rundle's method and to mix up their cases almost indiscriminately? One very important factor was the question of the particular method of ventilation adopted in the wards, and he found that Dr. Rundle favoured a system which ensured a very considerable dilution of the infective agent. Another important point—and he spoke as a bacteriologist, and possibly with some bacteriological bias—was that they were absolutely ignorant in most of the cases as to the nature of the contagion. Neither Dr. Rundle nor anyone else knew very much about the organisms they were endeavouring to combat. They were all working in the dark. A very great amount of effort and skill and time had been

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thrown away on secondary problems. It would be well if that skill and time and attention were devoted to discovering causes. As a manager of the Asylums Board he confessed to a very strong feeling indeed that, having had for many years a monopoly of the infectious diseases of London, and having spent on an average half a million annually in dealing with them, during nearly fifty years since the Asylums Board was instituted, there had not been half a million pence expended in endeavouring to prevent the infectious diseases with which the Board had to deal. He was hopeful that something would now be done, and in the meantime all this attempt at isolation was mere working in the dark. It must be confessed that at the present moment they had no control whatever over the progress of most of the exanthemata. Serious efforts should be made under proper and efficient auspices to do something in a direction which would, perhaps, deprive their medical superintendents of their bread and cheese, but would represent an enormous gain to the community at large.

The PRESIDENT (Dr. Theodore Thomson, C.M.G.) said at the present moment the bed isolation system could only be said to be on its trial. Dr. Rundle had heard a good deal of criticism that evening, as also on the previous occasion, and although his figures had their value, there were conditions which affected the degree of that value.

It did not appear to the speaker likely that the system of bed isolation would ever have a wide application. Good nursing was the inevitable condition of success in all systems of the sort, whether barrier, cubicle, box, or other. He visited Paris in 1893, and was taken round the Pasteur Hospital. There it was insisted on that the remarkable results obtained were due mainly to the quality of the nursing. At that time the nurses at the Pasteur Hospital were convent sisters who had been accustomed from early life to attention to minutest details and to blind obedience to their superiors. That was the reason, according to those in charge, for the success of the system. They in this country could not expect to get nurses of that type in large numbers, although admirable nurses were available, quite as good in their way as any convent sisters. But picked nurses were not easily to be had outside the large hospitals, and the hospitals which were not large, constituting the majority, had to do the best they could. Success depended on that condition. Without nursing of the best quality any of the systems under consideration would be a failure. A hospital superintendent who adopted the barrier system, and had not got nursing of the type that was essential, was taking a risk that few would care to take.

He wished to tender Dr. Rundle his own best thanks. In spite of the criticism which had been levelled against it, it was an admirable paper, as concise as it could be in dealing with such a large body of facts, and, in order to attain the results he had attained, his organization and his methods of administration must have been of a very high order.

Dr. RUNDLE, owing to the lateness of the hour, confined his reply to the briefest of answers to some of the questions which had been put to him. It was said at the last meeting that there had been few papers which had so invited—or was it “incited”?—discussion, and he thanked the members for their kind attention and criticism. Dr. Thomson had taken his courage in both hands in his adoption of the system, and the speaker had been glad to have the opportunity of seeing his work at close quarters. The infection in cubicle wards was just as likely to attack a patient at the far end of the ward as one close at hand. Adults would only have a limited use as “buffers” in the bed isolation system. Dr. Buchanan had suggested many omissions, of which the speaker was conscious. The chief criticism of his paper, however, had had reference to the fact that the subsequent history of his cases was not forthcoming. He had no definite information to give on that point, and he admitted that that was the weak point of his returns. The conditions in Liverpool where he worked were, however, very different from those obtaining in London. In Liverpool every matter connected with the public health was under the Medical Officer of Health. It was not divided between different authorities, as in the Metropolis. It was therefore extremely improbable in Liverpool that any considerable hospital incidence would occur without attracting attention. Again, chicken-pox was detained for fourteen days, whereas scarlet fever, whooping-cough, and the like were detained for three, four, or five weeks. Therefore, cases of the latter diseases had survived one, and possibly two or three, incubation periods of varicella. In reply to Dr. Goodall's question of the seventy-six cases of scarlet fever, the majority were quite mild. There was only one fatal case of scarlet fever. Dr. MacCombie, in speaking of oiling the lesions in chicken-pox, had misunderstood him. What he said was that oil was never applied except as a therapeutic measure. He did not suppose that 5 per cent. of the cases of varicella were oiled. His own experience in that particular work was not to be compared with that of Dr. Caiger, but he could not agree with the latter in his advocacy of the glass cubicle system. He pointed out, in reply to a question put by Dr. Turner, that in the general wards of fever hospitals bath sheets, for example, might be used for more than one patient, and that one of the latter might be incubating, or actually suffering, from varicella. That should not occur in the bed isolation wards, such articles being kept separate. Dr. Butler had confessed that he was not surprised at the results. That was quite in accordance with his own feelings, but he did not quite follow Dr. Butler in what he had said about the 186 less infectious or non-infectious cases. He thought the most interesting part of the experiment was concerned in the fact that of these 186 cases quite three-quarters, or probably 80 per cent., were not of the age of 10 years, and that these were side by side with the 527 more infectious cases, and not one of them developed an infectious disease.

Hypersensitiveness.

By E. W. GOODALL, M.D.

I FIND myself in a difficulty at the very outset of my remarks on what is admittedly a subject full of difficulties, a subject the discussion of which I should not have ventured to introduce had I not been requested to do so by your Honorary Secretaries. The difficulty to which I allude is that of definition. To the condition which is the subject of our discussion several names have been applied—to wit, hypersensitiveness, supersensitisation, and anaphylaxis. Richet, to whom we owe the last term, defined it as meaning "that curious property which certain poisons possess of increasing instead of diminishing the sensibility of the organism to their action." Since Richet's first experiments were made, it has been shown that hypersensitiveness may be set up by substances which are not necessarily poisonous, unless a very special signification is to be attached to the word "poison." But if the word "substance" be substituted for the word "poison" in Richet's definition, I should accept it as being satisfactory. The difficulty to which I refer, however, is due to the fact that recently certain writers have been applying the term "anaphylaxis" to almost any exhibition of sensitiveness to the action of certain substances. Take, for instance, the well-known serum-sickness, which so often follows the injection of an antitoxic serum into a human being. It manifests itself, broadly, in two forms: in one of them the symptoms appear after a lapse of several days, in the other after a much shorter interval, sometimes indeed almost immediately. Now it has been found that, with certain exceptions to which I shall refer later, the second variety of the sickness occurs in persons who have on some previous occasion been injected with serum, and the symptoms are of such a nature as, taken in connexion with the shortened interval between injection and sickness, to suggest that the patient has been rendered hypersensitive to the serum by the first injection. According to Richet's definition it is only these patients, that is, those who are the subjects of the second form of serum-sickness, who can be said to be in an anaphylactic state. Dr. D'Este Emery, however, in an admirable critical survey of the subject, which he presented to the Section of Pathology at the Annual Meeting of the British Medical Association last year, wrote of the

serum-sickness, and he meant both forms of serum-sickness, as being "perhaps the most important manifestation of anaphylaxis in man." But I should join issue with him on this point, and I would reserve the epithet "anaphylactic" for such cases as exhibited the abnormal form of serum-sickness. In my remarks, therefore, I shall employ the word in the sense in which it was meant to be used by Richet.

It was Richet who first worked experimentally at anaphylaxis. He prepared toxic substances from certain sea-anemones and mussels. He found that if he injected very small quantities of these substances into dogs no symptoms of illness followed; the animals remained apparently quite healthy; but if into the animals thus treated he injected, after an interval of several days, a second small dose of the toxic substance, a dose so small that it would produce no symptoms of illness in an untreated animal, then the dogs were extremely sensitive, exhibited toxic symptoms, and even died. Rather more than a year after the publication of Richet's earliest researches, Arthus brought forward evidence of hypersensitiveness produced in the tissues of the rabbit. Injecting horse serum subcutaneously into this animal he found that no noxious result of any kind followed. But when he repeated the injections at intervals, even in different localities, the tissues at the sites of the latest injections became inflamed and suppurated or sloughed. This condition is known as "Arthus's phenomenon"; and I mention it because it is met with very occasionally in the human subject. Arthus further found that if to a rabbit once subcutaneously injected with horse serum a second injection was given intravenously after an interval, the animal succumbed in a few minutes. The importance of the work of Richet and Arthus was forced upon the attention of other investigators, not only by its intrinsic merit, but by the light it shed upon certain phenomena which had been observed in connexion with the serum treatment of disease in man, and especially of diphtheria. The antitoxic value of serum is tested by injecting it together with diphtheria toxin into guinea-pigs. If the serum is sufficiently antitoxic the animal suffers no ill-effects. It was not unnaturally thought that such animals as remained healthy might be used again for the purposes of testing serum, and many were indeed so used. It was, however, found that in most instances if a period of several weeks had been allowed to elapse between the first injection or series of injections of serum and the second, certain symptoms immediately or almost immediately set in and the death of the animal very quickly followed. It was Theobald Smith who noticed that this

condition occurred only in "used" guinea-pigs; hence it has been termed "Theobald Smith's phenomenon," and its recognition was the cause of an investigation by Otto, of which the results were published in 1906. Meanwhile, somewhat similar, though fortunately not so constantly severe, effects of injections, usually second injections, of serum had been observed in human beings; and the significance of these clinical cases was pointed out by von Pirquet and Schick in 1905. It was, however, the occurrence of a few fatal cases which led to the investigation of the subject by Rosenau and Anderson, of the United States Public Health and Marine Hospital Service. Their first results were published in 1906. Since then a large number of observations, both experimental and clinical, have been made known, and the literature of the subject is already extensive.

Amongst all the facts ascertained by experiment there are some which stand out pre-eminently. First, the potentiality for producing the condition of anaphylaxis appears to be confined to proteins, animal and vegetable, as, for example, serum, milk, extracts of bacterial cells. Secondly, the protein must be foreign to the animal it is proposed to hypersensitize. Thus, while you can render a guinea-pig anaphylactic by injecting into it the serum of some other animal—e.g., a horse—you cannot do so if you employ either its own serum or the serum of another guinea-pig. Thirdly, between the injection of the first dose of foreign protein, called the "sensitizing" dose, and the second, called the "reacting" dose, a period of some length must elapse (latent period). It is usually longer than a week. Fourthly, the reacting protein must be the same as the sensitizing protein. For example, if you have sensitized a guinea-pig with horse serum, you can make it react only with horse serum; it will not react if you use, say, goat serum on the second occasion. There are, however, exceptions to this rule, especially in respect of the serum of nearly related species. Thus a guinea-pig can be sensitized to horse serum by treating it with the serum of a donkey. Fifthly, while animals are most readily sensitized by injecting the protein subcutaneously, intravenously, or into the brain, it is important to note that anaphylaxis can be induced by feeding them on foreign proteins. Sixthly, the symptoms of anaphylaxis vary not only in different species of animals, but even in animals of the same species. But they do not vary with the sensitizing protein. The rapidity with which they appear is influenced by the method employed for giving the reacting dose. Amongst the most common symptoms are: Signs of itching or irritation of the skin; cutaneous oedema; rapid and irregular respiration; death by asphyxia,

believed to be due to spasm of the muscles of the medium-sized bronchi; pulmonary emphysema; rapid pulse; pulsation of the heart long after cessation of respiration; fall of blood-pressure; collapse; a fall of the temperature; vomiting and diarrhoea; muscular spasms; paralysis; convulsions. Seventhly, passive anaphylaxis can be conferred upon an animal. Thus, if the serum of a guinea-pig which has been sensitized with horse serum be injected into a normal guinea-pig, the latter will react to horse serum after a comparatively short interval, an interval shorter than the latent period mentioned above. Eighthly, the young of a female animal which has been sensitized are in a condition of anaphylaxis to the sensitizing protein, whether the mother has been sensitized before or after conception. That is to say, anaphylaxis may be congenital. Ninthly, according to Rosenau and Anderson, guinea-pigs can be rendered refractory to the reacting dose if they receive a series of doses of the protein daily for ten or more days. Tenthly, and lastly, the duration of anaphylaxis appears to vary with the animal.

So far I have been speaking of the facts of anaphylaxis as they have been ascertained by experimental investigation in animals. I will now say a few words on the condition as it has been observed in man. Nearly all the facts of human anaphylaxis have been obtained from observations made of the serum and vaccine treatment of disease, and especially of the former. As soon as the antitoxin treatment of diphtheria was introduced it was noticed that a certain number of the patients who received the serum exhibited symptoms which, it was clear, were caused by the serum. The chief symptoms of this serum-sickness, as it was subsequently termed by von Pirquet and Schick, were fever and rash. Occasionally, also, there was arthritis, usually not severe. An experience of some thousands of cases, extending over nearly eighteen years, shows that about one-third of the patients suffer from a rash, usually with, but occasionally without, fever, and that about one in every six of these cases also has arthritis. It is very rare to get arthritis without a rash. An attack of serum-sickness will follow, and frequently does follow, a single injection of serum. I have said that about one-third of the persons injected suffer from serum-sickness; that is to say, that one-third are susceptible to the effects of the serum, reveal an idiosyncrasy to it, while two-thirds do not. Further, in the production of serum-sickness the peculiarity of the serum has to be considered, for it is a matter of common experience that some serums will give rise to an attack of serum-sickness in a much larger proportion

of the persons treated than do other serums; and again, the severity of the attack of sickness varies not only with the persons attacked, but also with the serum. Another point to be noted in connexion with the serum-sickness is that between the injection of the serum and the onset of the illness there is an interval which is quite free from any symptoms of this particular disease. This interval has been called the incubation period, but I think it would be better to call it the latent period, for I am much inclined to doubt whether it is strictly analogous to the incubation period of an infectious disease. The length of the latent period is commonly eight to sixteen days; it may be as short as three or as long as twenty-one days; I have known it to be even longer, but it is very seldom shorter than six days; that is the important point to bear in mind. I am speaking now, be it remembered, of cases in which there has been only one injection or series of injections in the course of four or five consecutive days. So far in respect of the ordinary form of serum-sickness, which may be termed the normal reaction of horse serum in the human subject; though unpleasant, it is rarely serious.

As time went on, after the introduction of the serum treatment of diphtheria, cases were met with in which the patient was suffering from a relapse or a second attack of diphtheria. Naturally he was subjected to the serum treatment, and it was then observed, in respect of some of the cases, that the patient underwent an attack of serum-sickness of quite an unusual character; and it was further observed that an unusual attack of the sickness was confined to persons who had been treated with serum in the primary attack of diphtheria. The unusual nature of the serum-sickness may be shown in more than one way, but there are three chief varieties: In the first the latent period is normal, but the symptoms are severe beyond the average, and uncommon symptoms may be present; such as faintness, intrathoracic and abdominal pain, invasion of the mucous membrane by the rash, and rapid evolution of the symptoms. In the second the latent period is shorter than normal, being from one to five days; the symptoms may or may not be unusually severe. In the third the latent period is very short, rarely longer than six hours, and not infrequently a few minutes, and the symptoms are prone to be of unusual severity and character: a high temperature; rapid evolution of the symptoms and invasion of the mucous membranes by the rash; cyanosis; hurried breathing; a rigor; even convulsions and collapse. From the hypothetical point of view the most important features of these unusual attacks are the reduction of the latent period and the

rapid evolution of the symptoms. The second and third varieties described above have been called by von Pirquet and Schick the "accelerated" and the "immediate" reaction respectively. And it was pointed out by these observers that an abnormal reaction never took place in a person who was reinjected within a certain period from the primary injection, and that this period was never shorter than the average latent period. This is the chief fact that shows the abnormal reaction to be an anaphylactic phenomenon.

Just as not every person injected with serum undergoes an attack of serum-sickness, so not every reinjected person shows the anaphylactic reaction. During the fifteen years 1897 to 1911, 181 persons, mostly children, have come under my observation who have been treated with serum on two separate occasions for a primary attack, and for a relapse or second attack of diphtheria. Of these 116, or 64 per cent., underwent an attack of serum-sickness after the injection given for the relapse or second attack, that is, nearly double the average number of cases which follow a primary injection. In 89 of the 116 the latent period was shorter than six days.

I have stated above that in animals the duration of the anaphylactic condition has been found to be variable. It is believed to last the lifetime of a guinea-pig. I do not know how long it lasts in man; perhaps for his lifetime. I have recently had under my observation a youth who was injected with serum in the Eastern Hospital on October 15, 1904, when he was aged 10. After a latent period of eighteen days, rather longer than usual, he underwent an attack of serum-sickness (fever, rash and joint pains). On December 7, 1911, that is to say, 2,609 days after his first injection, upwards of seven years, he was reinjected with serum for a second attack of diphtheria. Half an hour after the injection a rash came out on his face and remained out till the next day, and four days after the injection appeared the first symptoms of a severe attack of serum-sickness (fever, rash and arthritis). Amongst my cases the shortest interval between the first and second injections, in which the latter has been followed by an abnormal reaction, has been eighteen days.

Besides these instances of anaphylaxis in persons who have been sensitized by a previous injection of serum, there are now a considerable number of cases on record in which the anaphylactic phenomena have occurred after a single primary injection of serum. It is this group which has furnished examples of the immediate reaction of the most severe character. Some of them have been fatal. I was fortunate

not to have a fatal case amongst those I referred to above, who were treated twice with serum; but three or four of them gave me much anxiety for a short time. I shall say something later about these cases of anaphylaxis after a primary injection.

After this very brief account of the facts of hypersensitiveness as they have been elicited by experiments on animals and by observations on serum-sickness in man, I pass to a consideration, which must also be brief, of certain problems which it has been hoped, if not expected, would be illuminated by the facts mentioned. It will, however, be necessary first to say a few words on the sequence of events which terminate in the anaphylactic state. To explain the phenomena almost as many hypotheses have been put forward as there have been investigators. There are at least three distinct views. First there is Courmont's suggestion, that the injection of the foreign protein leads to the absorption of an inherent protective substance, the loss of which leaves the animal defenceless against a second injection of the protein. The second is that propounded by Gay and Southard, who believe that the foreign protein contains a substance (anaphylactin) which sensitizes the cells of the body, but is slow in its action and does not produce toxic symptoms. The foreign protein also contains other substances, of a toxic nature, which are rapidly eliminated from the body, so that they have disappeared by the time the cells have been sensitized by anaphylactin. On a second injection, however, of the foreign protein, the fresh supply of these substances acts at once upon the sensitized tissues, and the phenomena of hypersensitiveness are produced. The third, and most favoured, hypothesis is that which supposes the evolution of antibodies. This is the view which best harmonizes with Ehrlich's side-chain hypothesis. The introduction of the antigen, in this case a foreign protein, gives rise to the slow formation of an antibody; and some reaction between the antibody, newly formed and continuing to be formed, and the antigen or some constituent of it, causes the normal reaction seen in the human subject. When a fresh amount of antigen is introduced, there is a rapid combination or reaction between it and the antibody, and the immediate reaction is the result. The accelerated reaction can be explained by the supposition of von Pirquet and Schick, namely, that, besides the production of antibody, a result of the primary injection of the antigen is such an alteration of the tissues as to allow of a more rapid formation by them of an antibody, when fresh antigen is introduced, than after the primary injection. To this altered state of the tissues the term "allergy" has been applied.

Has the acquisition of the facts of anaphylaxis brought us nearer the solution of any of the problems which interest especially the members of this Section?

The hypersensitive condition reminds us of the negative phase which was discovered by Sir Almroth Wright to be induced by and to be present very soon after the injection of bacterial vaccines. During this phase the bactericidal power of the blood is diminished. The phase, however, is transient, and is succeeded by a positive phase of much longer duration, in which the bactericidal power is higher than it was before the introduction of the vaccine. But the negative phase may be prolonged by reinjection of the vaccine before its termination, and by the injection of large amounts of vaccine. Richet believes that anaphylaxis is a step towards the production of immunity; and in this view he is supported by Anderson and others. The animal has been brought to such a condition as to offer a very rapid and active resistance to the sensitizing toxin; and this condition may be regarded as being even advantageous to the animal. I should mention that, at any rate in some animals, if the animal has survived the effects of the reacting dose, subsequent doses have no effect. The animal is then said to be in a condition of anti-anaphylaxis. I take it I am right in supposing that this is a condition which is of the nature of immunity, of course only in respect of the particular protein employed. But it is very difficult to reconcile Richet's view with the facts of anaphylaxis as it appears in the guinea-pig, or even in the human subject. The primary dose of protein hypersensitizes the guinea-pig to such a degree that it frequently succumbs to the reacting dose, and the animal never has a chance of becoming immunized. Moreover, in that animal the condition is by no means transient. It must also be remembered that very small, even minute, doses of the protein are efficacious for the purposes of sensitizing and of reacting, and that for each of these purposes one single dose is sufficient. To produce immunity to the action of the protein, either a number of successive doses at short intervals (a day or so) during a considerable period are necessary, or the animal must receive three injections of the protein at longish intervals and survive the effects of the third. I agree, therefore, with Dr. Emery in rejecting Richet's views.

A similarity between the course of events and the symptoms of serum-sickness in man and those of an attack of certain of the acute infectious diseases has suggested that the latter may be explained by the former. Between the injection of the foreign protein (horse serum).

and the onset of the symptoms of serum-sickness is an interval of a week or two's duration, a latent period which recalls the incubation period of many of the acute infectious diseases. In fact the latent period of serum-sickness is often called the incubation period. Again, the symptoms of serum-sickness resemble in several points those of certain of the acute infections. These are a rash, fever, and often glandular enlargements. Dr. Emery well summarizes the anaphylactic hypothesis of the development of an attack of an acute infectious disease as follows, after having first drawn attention to the fact that a bacterial protein will act as a sensitizing agent: "A few bacteria gain access to the body and some of them disintegrate, so that their proteins, or some derivative thereof, gain access to the tissues and render them sensitive. The remainder of the invaders have a prolonged tussle with the defences of the body, but after a time they grow to such an extent that they give off enough protein to constitute a reacting dose, and symptoms develop. The period which this takes would constitute the period of incubation, which I think cannot be accounted for satisfactorily on any other theory." It is clear, however, from a remark made later in his paper, that this hypothesis does not completely satisfy Dr. Emery. I confess that it does not satisfy me. In my opinion the resemblance between serum-sickness and an attack of an acute infectious disease is much more apparent than real. To me it seems to be a fatal objection to the hypothesis that whereas after an attack of an acute infectious disease the individual is immune to another attack, usually for a considerable length of time, the person who has undergone an attack of serum-sickness often remains in an extremely sensitive condition in respect of another injection of the protein which caused the sickness. Moreover, clinical experience goes to show that relapses and second attacks of the acute infectious diseases, far from being more severe than the primary attack as they should be on the anaphylactic hypothesis, are as a rule less severe.

The occurrence of a rash in serum-sickness is also another superficial resemblance between it and certain of the acute infectious diseases. The most common rashes of serum-sickness are urticaria and a variety of erythema multiforme, frequently erythema marginatum. Now I do not know of any infectious disease whose distinctive rash is urticaria, and only one in which it is erythema marginatum—to wit, acute infectious erythema, a disease I have never seen. It is said to be infectious and epidemic, but its occurrence has so far been rare. It is quite true that serum-sickness rashes are not infrequently described as being

morbilliform and scarlatiniform, but I think that often this brief description is given to save the writer's pen. In my experience these rashes are very rarely quite like those of measles and scarlet fever. And I never yet saw an antitoxin rash that bore the slightest resemblance to the eruptions of small-pox and chicken-pox. But for another fact, to be mentioned presently, I should not be disposed to attach any importance to the absence of a close resemblance between the rashes in question; bearing it in mind, however, I think the differences are worth noting.

Though I have not derived much satisfaction from a comparison of the phenomena of anaphylaxis and an attack of an infectious disease, yet I am far from believing that clinical medicine does not present us with instances of a condition which is akin to, if not the same as, hypersensitiveness to proteins. One cannot help being struck with the similarity between attacks, and especially the more severe attacks, of the immediate reactions, and attacks of illness brought on by the ingestion of certain articles of diet, the bites of certain insects, and the inhalation of certain pollens and other matters. Now when these illnesses are accompanied by a rash it is very frequently urticaria or a variety of multi-form erythema. Dyspnoea and collapse are also met with. I have mentioned earlier in my remarks that the immediate reaction occurred after a second injection of serum, but that it has also been observed to follow a primary injection. In fact, most of the severest cases belong to the last group. It is a curious fact that a large proportion of these cases of immediate reaction after a primary injection have occurred in persons who were the subjects of asthma or some allied condition. Some of the victims have been peculiarly sensitive to the emanations from the horse. I have mentioned that the anaphylactic state can be transmitted, in some animals at any rate, from the mother to her offspring, and also that it can be induced by ingestion as well as by injection into the tissues of a protein. There are grounds, therefore, for assuming that one person is congenitally anaphylactic, and that another is sensitized by an article of food.

When discussing the resemblance between an attack of serum-sickness and of an infectious disease, I stated that there was one fact that led me to attach some importance to the differences between the rashes of serum-sickness and those of the exanthemata. This fact is that while the common rashes of serum-sickness (urticaria, &c.) are not those distinctive of the acute infectious diseases, they are very frequent accompaniments of the anaphylaxis-like attacks to which I have just alluded (food-poisoning, insect-bites, asthma fits, and the like).

Further, while the serum rashes are not those which are diagnostic of the acute exanthemata, yet urticaria and erythema multiforme are frequently met with as so-called "secondary" or "accidental" rashes during the course of an acute infectious disease; so that I am inclined to believe that if we are to find anaphylactic phenomena in these diseases we must search not so much during their early as during their late stages.

It has been suggested recently that to the more obvious examples of anaphylaxis (obvious, I mean, because of their clinical resemblance to serum-disease in man and the illnesses induced experimentally in animals) there should be added a variety of other diseases, of which the causes have hitherto escaped a satisfactory explanation—e.g., "fits" of various kinds (uræmic, eclamptic, &c.). To suppose that some of them were examples of anaphylaxis would be to suppose also that an individual could be sensitized by a protein elaborated somewhere in his body. But might not a protein of morbid origin, or a protein derived from some particular and limited tissue, act as a foreign protein to the tissues generally? Some evidence has been adduced to show that this may be the case. For further particulars concerning these diseases I may refer you to a paper by Dr. Batty Shaw in the *Lancet* for March 16, 1912, as I have not now the time at my disposal to enter into details concerning them.

It may be said that the recognition of such and such a morbid state as an example of anaphylaxis does not bring us nearer the explanation of the condition; it is merely a multiplication of instances. Even if we admit this statement to be true, at any rate for the present, yet I think it will be allowed that the acquisition of this new set of facts may be of great service in the treatment and prophylaxis of disease.

DISCUSSION.

The PRESIDENT (Dr. Theodore Thomson, C.M.G.) said that it would be generally agreed that hypersensitiveness had an important bearing upon their work as epidemiologists, and Dr. Goodall had furnished them with a brief but most lucid exposition of a complex question. The Section was greatly indebted to him for his contribution, and it was regrettable that so few bacteriologists were present to express an opinion from their point of view upon the issues involved.

Dr. W. H. HAMER asked whether the reader of the paper had any observation bearing upon the relation of this condition of hypersensitiveness to susceptibility to mussel-poisoning and to the irritation induced in some persons,

more particularly children, by flea-bites; there were, moreover, the remarkable instances of extreme sensitiveness to contact with jelly-fish. Was it the case that people who were prone to develop urticaria, and children on whose skins large wheals were raised as a consequence of flea-bites were also victims in these antitoxin injections?

Dr. E. C. BOUSFIELD said that there were one or two points in connexion with the subject that lent themselves more particularly to discussion. Personally, he did not feel at all sure, after hearing what Dr. Goodall had to say, that the phenomenon he had been describing was really anaphylaxis. The essence of anaphylaxis, as it was understood among bacteriologists, was that an extremely small dose of a given protein sensitized the organism in such a way that a further minute dose would produce very deleterious effects. But Dr. Goodall had been speaking that evening mainly of the injection of the diphtheria antitoxin, and here the practice under the Metropolitan Asylums Board was to use extremely large doses, much larger than those administered in private practice. One could hardly call a dose which might go up to 20,000 units a minute dose, especially if it were administered intravenously, nor could one suppose that the resulting phenomena would have the same signification as when a minute dose was given. He thought that the explanation of the phenomenon which Dr. Goodall had proved to exist in the case of diphtheria must be sought for on some other lines than those associated with anaphylaxis. There was one other point upon which the speaker did not pretend to offer an explanation, since it needed very much more investigation than it had hitherto received. It would be well to begin with the serum of the persons infected, and to try to discover whether any effect could be produced by injecting into guinea-pigs the serum of the person who had been injected with the diphtheria antitoxin. It could then be found whether or not the guinea-pigs were protected against anaphylaxis by this injection. It might be that the relation was rather on that side than on the side of true anaphylaxis. Dr. Goodall had asked whether a protein of morbid origin or a protein derived from some particular and limited tissue might not act as a foreign protein to the tissues generally. It occurred to the speaker as Dr. Goodall was reading this part of his paper that a remarkable instance was afforded by the case of cancer, where tissues which had varied to some extent from the normal did produce an amount of cachexia which was totally out of proportion to the bulk of the growth. This seemed to furnish some kind of an answer to the question proposed by Dr. Goodall.

Dr. E. G. L. GOFFE asked whether Dr. Goodall did not think it advisable to substitute in the report of the Metropolitan Asylums Board for "antitoxic rashes and other phenomena" some term which would imply hypersensitiveness. It might be misleading under certain circumstances to attribute these things to the antitoxin and to call them antitoxic phenomena. Had he not some other suggestion to offer in the place of the terminology employed in the reports of the Metropolitan Asylums Board?

Dr. GOODALL, in reply to Dr. Hamer's question, confessed that he had no experience. Now that attention had been drawn to these effects a good deal should be found out by actual clinical observation. It was very necessary to learn more about the patients in whom the serum phenomena appeared. With regard to the point raised by Dr. Bousfield, it was a curious fact in the speaker's experience that during recent years he had not seen so many serious reactions after serum as was the case twelve or thirteen years ago. This absence of severe reaction was possibly due, he thought, to the fact that it was now the practice to give larger initial doses in volume of the serum than formerly. At the beginning of serum treatment the practice was to give rather small doses at first, such as a few cubic centimetres; now it went up to several cubic centimetres. Those persons who had a serum reaction after the first injection were much more likely than others to show an abnormal reaction after the second. As to nomenclature, the name given to the condition by von Pirquet and Schick was "serum-sickness," and he did not quite know what else to call it.

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The Council think it right to state that the Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Laryngological Section.

November 3, 1911.

Dr. STCLAIR THOMSON, President of the Section, in the Chair.

Expansion of the Jaws, by means of Dental Plates and Screws, for Nasal Obstruction due to Narrowed Nasal Passages.

By DAN MCKENZIE, M.D., and HENNING JAMES, L.D.S.

THE method has been used in America, and with considerable success according to the reports. The treatment of this type of nasal stenosis has hitherto been very unsatisfactory. The septum is usually deflected, but its rectification fails to provide sufficient room; adenoids are not infrequently present, but their removal does not cure the mouth-breathing; the reason being, of course, that the nasal passages are narrowed by reason of non-expansion of the superior maxilla.

The important detail in this method of treatment is that the expansile pressure of the plate on the teeth must be rapidly induced. The screw should receive a turn every day, or every other day, and the whole process is complete in a few weeks. The treatment may be rather painful. Naturally, the younger the patient the better the prospects of improvement.

The present patient, a young woman, aged 19, has worn the plate for about four weeks. She reports great improvement, but as she has had adenoids removed also, all the betterment cannot be attributed to the dental treatment.

DISCUSSION.

Dr. BRONNER asked if it was not rather dangerous for children to wear a plate of that kind pressing on the teeth for such a long time. He thought the teeth might be pressed and grow outwards. He understood that in young children the teeth could be made to grow in almost any direction.

2 McKenzie & James: *Expansion of Jaws for Nasal Obstruction*

Dr. DONELAN thought the result of the treatment very good bearing in mind the age of the patient. The improved nasal breathing was probably the physiological effect of the removal of the adenoids. He thought the apparent widening of the alveolar arch was due rather to rotation of the teeth than to any actual movement of the superior maxillæ in the horizontal direction, certainly not to such an extent as would affect the width of the nasal cavity. Very good cosmetic results were sometimes obtained, especially in young patients, by the use of dental plates. He instanced a case of a girl who had marked buccal deformity resulting from adenoids, in whom a remarkably good result had been obtained by Mr. Lloyd-Williams by the use of plates after the adenoids had been removed. No screw had been employed and he could not imagine the soft parts tolerating any pressure that could possibly affect the position of the bones.

Dr. WATSON-WILLIAMS said the case was of such interest that he hoped the exhibitors would try and show it again, say in a year's time, after there had been fuller experience of the treatment.

Dr. DUNDAS GRANT thought it could not be doubted, from what had been said by most reputable operators in that line, that the treatment was efficacious, and workers in England could justly blame themselves for not having taken it up sooner. The Section was indebted to Dr. Dan McKenzie for having brought the matter forward. When Dr. Mercer, of Detroit, was in this country he was surprised to see that the procedure was not in general use here. With regard to the effect of it in this case, the patient was convinced that her nasal breathing was better than it had been formerly, but as Dr. McKenzie said, the removal of the adenoids had something to do with it. The casts which Mr. James had brought were, however, absolutely convincing as to the enlargement which had taken place. The vault was lowered, and the septum therefore straightened out. He would like to know how the method would answer when the lower jaw was already too small. He had such a case under his observation recently, in which he thought that plan of treatment would be applicable, but the lower jaw was so small that there was no bite, even at the sides, and if the upper jaw was widened the patient would have been in a still worse state.

Dr. W. HILL asked what was the limit of age at which such a procedure would be beneficial. Nineteen seemed an unfavourable age, and he would like to hear if the exhibitors expected to be able to increase the width of the arch sufficiently to widen the nasal passages, and if they could not devise some means for the measurement of the nasal passages, not by the graphic method, but by means of casts which would be convincing. He was open to conviction, but he would require strong evidence to believe that the nasal passages could be very much enlarged at the age of 19 by alveolar expansion.

The PRESIDENT (Dr. StClair Thomson) said that the chief point was as to whether there was risk of pressure outwards or rotation of the teeth, and whether proof could be afforded that the nasal passages were enlarged by the

method. This latter might be tested by means of a so-called rhinogram, for setting out the respiratory area. He had been inspired by reading the American journals on these matters, and he had seen many cases which were under dental friends in London. He also would like to know what were the indications as to age in these cases, because some dental surgeons had sent cases back to him with the statement that the child was not the proper age for it to be done. Evidently dentists did not like cases too young.

Dr. DAN MCKENZIE, in reply, pointed out that the object of the treatment was not to displace the teeth; that if the teeth were displaced by it, the treatment was so far not accurately directed towards its end. The object of the treatment was to expand both halves of the jaw *en masse*, not the teeth at the expense of the alveolus, or the alveolus at the expense of the arch. So the plate having been put in the pressure had to be applied to both sides for a short space of time. By the ordinary methods of displacing the teeth by means of a plate a considerable time was taken, the teeth being moved slowly. But in the present method the teeth were not supposed to be moved at all. The movement which took place was that of the lateral halves of the jaw, and it must be brought about in a few weeks. The plates were made so as to press on the teeth only, not on the soft parts. Reports from abroad showed that such cases were cured by this form of treatment. The method caused pain, and required assiduous and daily care, but the results were extremely good. He exhibited the case not to show that the treatment had succeeded in this particular instance, but rather with the idea of advertising the treatment, so that it might be more widely carried out in this country. The patient herself felt quite certain that she breathed better now than formerly, and he believed that this was not altogether the result of the removal of her adenoids, because in that particular form of nasal stenosis no operation, whether for the removal of adenoids or the rectifying of the septum, would make any difference to the nasal respiration. Something more was wanted, and this was the only method he knew of in which an attempt was made to remedy what had hitherto been incurable.

Mr. HENNING JAMES, in reply, said the plate must be made to prevent rotation of the teeth. The little vulcanite plates must fit quite well to the teeth, so that the teeth could not rotate. With regard to the question of pushing out the teeth, that was influenced by the direction of the force exerted. The force must be so applied that the teeth did not splay outwards. In answer to Dr. Grant's remark about the lower jaw, it required an appliance to expand the teeth in the lower jaw. He did not think one could do it with a jack-screw. It could be brought about by means of the ordinary method of using expansion plates. With regard to bringing down the arch, he had seen some cases of this in which it was done in children of 13 or 14 years of age. It took about two years to accomplish, but there was no question of nasal treatment in them, only dental treatment. No doubt the arch had come down considerably, and he had in his possession some models which would show it. The

whole arch was broader and flatter. With respect to bringing back the incisors, if one gave a wider arch at the back of the mouth, one could carry it to such an extent that the incisors could be pulled into their proper place. But that had no connexion with this treatment; it was purely dental. With regard to age, he saw one patient, a woman aged 27, who had considerable expansion in the upper jaw, to whom the treatment was applied. But it was not wise to use it for patients who were getting on in years, because in them there was danger of bringing about permanent looseness of the teeth. If the procedure was carried out in a patient who was approaching 30 years, one should be particularly careful to avoid overdoing it; the patient should be examined every day. He did not think there was any age at which one could not push the teeth outwards. It was wiser to wait until the molars and premolars were in place—i.e., about the twelfth or thirteenth year.

Epithelioma of the Larynx in a Man, aged 23.

By STCLAIR THOMSON, M.D.

THIS patient was shown at the April meeting of the Section.¹ The microscopic section of a portion of the larynx showed it to be malignant, although the clinical symptoms were very unlike epithelioma. The case was discussed by Dr. Watson-Williams, Dr. Scanes Spicer, Dr. Jobson Horne, Mr. De Santi, and Mr. Tilley, and the general view was that the case was quite unlike an epithelioma. In the meantime the glands had become infected, and a portion of one had been removed and a section made. It was again pronounced to be epithelioma.

DISCUSSION.

Dr. STCLAIR THOMSON added that the man was not well enough to be present at the meeting, but the section was under the microscope. The slide had been inspected at a clinical meeting of the Medical Society of London, and had also been sent to the Morbid Growths Committee.

Dr. W. HILL asked if any further doubt had been thrown on the nature of the case. He accepted the diagnosis, but the early age made one at first doubtful. Mr. Hope, however, had recently had a case of malignant growth of the œsophagus in a man, aged 27, and the clinical diagnosis was confirmed by microscopical examination. He believed 14 years was the earliest age at which a genuine growth of the kind had been known. But it was very unusual and likely to lead to a wrong diagnosis for a few months.

¹ *Proceedings*, 1911, iv, p. 119.

Dr. KELSON said that Mr. Rose stated that the section had been examined by members of the Morbid Growths Committee, and had been submitted to Dr. Andrewes and to Mr. Shattock. The opinion expressed by all who had examined it was that the growth was an epithelioma.

The PRESIDENT said that clinically the case looked like one of perichondritis. He scraped away some tissue when again looking into the larynx, and the report on it had just been read. The man was now having hæmorrhages, and was going downhill very fast. One of the glands was taken away, and the microscope showed it to be epitheliomatous.

Pedunculated Intrinsic Growth of Larynx in a Man, aged 41.

By J. EVERIDGE.

THE patient, a Covent Garden porter, attended King's College Hospital in September, 1911, complaining of hoarseness of two months' duration, which came on gradually. He coughed up a little blood-streaked sputum about the time when first noticed; none since. Syphilis denied.

Condition on September 17: A pedunculated tumour, the size of a small cherry-stone, growing from the free margin of the posterior fourth of the right vocal cord. Tumour smooth, globular, and of a uniformly purplish-red colour; the pedicle lax, allowing tumour to be drawn into the glottis during inspiration and for the cords almost to meet over it, and during expiration to be blown out. Cords moving normally. It was diagnosed as a benign tumour, probably a vascular fibroma.

Three weeks later (October 13): When patient reappeared the surface of the tumour was less uniform, and presented on its summit an excavated nodular area with sharp margins, suggesting partial necrosis; the capillaries on the rest of the surface were somewhat dilated and a small hæmorrhage was seen. Tumour was rather larger, the pedicle broader. The right cord was now seen to have lost its normal colour, and to be distinctly reddened, suggesting some inflammation or possibly infiltration. Though moving well it seemed to be slightly less motile than the left. Enlarged glands could just be felt along anterior border of sterno-mastoid and beneath angles of lower jaw.

October 20: The process of necrosis has got a stage further, for the tumour now presents a deep angular bay with its base towards the

6 Everidge: *Pedunculated Intrinsic Growth of Larynx*

original summit of the tumour. The reddened appearance of the cord is more marked, but cord moves well.

October 27: There is no marked change in condition of tumour to-day.

As the tumour has some atypical features, the opinion of members is invited. Clinical examination at the first appearance suggested an entirely innocent neoplasm, but the situation, the age of the patient, the nodular dirty-grey surface, inclines one to the opinion that in this case only the microscope will settle the diagnosis. The case was thought to be interesting enough to show before the tumour was removed.

DISCUSSION.

Dr. DUNDAS GRANT said that many years ago Mr. George Stoker brought before the British Laryngological Association¹ a case of pedunculated growth. He removed it with the snare, and the microscopist reported that it was an epithelioma. Dr. Grant had not seen such a case since. The specimen was almost unique. The most curious surprises Dr. Grant had had were in connexion with what appeared to be simple growths which turned out to be tuberculous. He thought that was probably the nature of the present one. The base from which it grew was infiltrated, and a confirmatory feature in favour of his view was the man's loss of weight. His muscles were now in a flabby condition. There was also a suspicious ulceration on the growth.

Mr. HERBERT TILLEY favoured the diagnosis of fibroma, and thought that the ulceration was due to the constant friction and pinching of the growth by the cords. He thought the ulceration was due to the friction on the distal part of the growth where its blood supply was poor. If it was to be removed he hoped a section of it would be shown at a future meeting of the Section.

Dr. JOBSON HORNE said the growth was in the situation usual for tuberculous growths, and that was the only evidence in favour of it being a tuberculoma.

Mr. MARK HOVELL said he would not like to express a definite opinion; he would rather remove the growth and then decide, because naked-eye appearances were often deceptive.

The PRESIDENT said he also had had a case of pedunculated growth in the same situation. The base was not infiltrated, but under the microscope it was found to be typically epitheliomatous. That patient, however, was older—viz., 59.

Mr. EVERIDGE, in reply, said the tumour would shortly be removed, and he would be glad to report the result of the microscopical examination.

¹ *Journ. Laryngol.*, Lond., 1911, v, 183-5.

Two Cases illustrating Unusual Complications of Chronic Empyema of the Nasal Accessory Sinuses.

By HERBERT TILLEY, F.R.C.S.

CASE I.

H. P., MALE, aged 71, applied to the Ophthalmic Department of University College Hospital because for a month he "had seen double, and for three months he had noticed a swelling in his right upper eyelid."

Examination showed that the eye was displaced downwards and outwards, and there was a fluctuating, rather tense swelling between the inner half of the bony margin of the orbit and the eyeball. It was not painful on pressure, neither had he suffered from any headache or inconvenience beyond the diplopia. The skin was not red nor inflamed. He made no mention of any nasal discharge, but when the nose was examined pus was seen in the middle meatal region; a foul discharge was washed from the right antrum, but it was not possible to pass a cannula into the frontal sinus.

May 3, 1911: The frontal sinus was opened by an incision in the line of eyebrow, terminating above the internal canthus. On exposing and opening the tense swelling foul pus escaped, and a probe readily entered the sinus. The anterior wall of the sinus was freely removed, when further examination showed that the roof of the orbit and the posterior wall of the sinus had been completely destroyed, so that the contents of the orbit below and the dura mater posteriorly, assisted to form the walls of a large empyema. The sinus cavity was carefully cleansed, a free opening made into the nose, and the wound lightly packed. A Caldwell-Luc operation was immediately carried out on the right maxillary antrum and diseased ethmoidal regions removed.

The patient has made an uninterrupted, though slow, recovery, and has remarkably little deformity.

An interesting feature in the case is that he never complained of any headache or other inconvenience beyond the diplopia.

CASE II.

Mrs. H., aged 35, applied to University College Hospital in July, 1911, because she was feeling very ill and there had been a swelling for five weeks above the right eye, which burst on July 28.

The following facts were elicited: An offensive discharge from right nostril for five weeks; a swelling around the upper and inner part of the right eye for five weeks, which burst on July 25; diplopia five weeks; nasal obstruction for nine weeks.

Patient was a thin, frail woman who looked very ill on admission. The right eye was proptosed and the conjunctiva red, swollen, and chemosed. The upper eyelid was very swollen, red, and œdematous; a condition which passed upwards over the lower right frontal region and shaded away about the region of the "eminence." Inferiorly the swelling extended downwards over the cheek to the level of the right angle of the mouth. A probe passed into the fistula under inner angle of eyebrow led to carious bone about the inner and posterior region of the orbit, but not into the frontal sinus. The whole of the swollen regions were very tender on pressure. Examination of the nasal cavity was impossible because the entry thereto was quite blocked by a much-swollen, hyperæmic inferior turbinal. Posterior rhinoscopy revealed a quantity of pus in the posterior choana. Temperature, 100° F.; mental condition very obtuse.

An incision was made as in Case I, passing through the fistula. The frontal sinus was exposed and opened; it was small and contained thick, viscous pus. The contents of orbit were then pressed gently outwards and downwards by a small spatula, and a quantity of pus escaped from the inner and posterior regions of orbit. The ethmoid region was extensively diseased, and a black, foul sequestrum, the size of a horse-bean, removed from the region of the posterior cells. The diseased areas were carefully removed and a light dressing placed in frontal sinus. A Caldwell-Luc operation was then carried out on the right maxillary antrum, which was found to be full of thick, putty-like, caseated pus.

Patient was very drowsy for a day or two after operation, but local conditions rapidly improved. On August 4, till the end of the month, anxiety was caused by physical signs in the right chest indicating consolidation or the development of an empyema. These were associated with pyrexia (100° F. to 103° F.) and a distressing cough. The lung and pleura were aspirated three times, but with negative result.

Early in September the lung symptoms cleared up, and the patient is now quite well and shows very little deformity as a result of the operation on her frontal sinus.

DISCUSSION.

Dr. W. HILL said it was very unusual to get in such a condition as rhinitis caseosa in the antrum. He thought that term accurately described the putty-like contents mentioned by Mr. Tilley. He had seen it only in cases where a foreign body was present, and he once had to deal with it in a valuable horse, the winner of a Grand National. He removed a putty-like mass as large as his fist from the frontal sinus under cocaine anæsthesia. He had also shown a case before the old Society, where a rhinolith, in association with unilateral rhinitis caseosa, was present in the antrum, the antro-nasal wall having disappeared.¹

Dr. WATSON-WILLIAMS asked if a bacteriological examination had been made. It would add to the interest of many of the cases shown before the Section if bacteriological examinations were made. One of the points of great interest was as to how far different micro-organisms influenced the clinical course of cases otherwise apparently identical. He congratulated Mr. Tilley on the excellent results obtained, cosmetic as well as surgical.

Dr. DUNDAS GRANT said he regarded the black sequestrum from the region of the posterior cells as the most unusual feature in the cases. It was unusual to find it in a case where there was not some dyscrasia such as syphilis, although there seemed to be no sign to suggest that there was syphilis here.

Mr. HERBERT TILLEY, in reply, said he regarded the first case as unusual, because the old gentleman had lost the whole posterior wall of the sinus, so that the frontal lobe was only covered by dura mater and by granulation tissue, and the tissues of the eyeball were also free in the floor of the frontal sinus. It was curious that he denied having nasal discharge, or that there was anything the matter with him beyond "seeing things double." He said he had never even had headache. He was sent into the ear and throat department by the ophthalmic surgeon to see if any light could be thrown on the cause of the diplopia. The second case was unusual because of the ethmoidal sequestrum, and if any members had seen the patient at the time of the operation they would have agreed it was a most unusual case. She looked so ill that he was doubtful whether it was worth while to interfere. It was also interesting from the point of view of the condition of the antrum and ethmoidal cells. The sequestrum which he removed from the ethmoid might have had something to do with the caseous masses in the antrum and ethmoid region. In answer to Dr. Watson-Williams, with reference to the male patient, a culture of the pus organisms was made, but he could not recollect the details of the report, and the operation on the woman was performed at night, when it was difficult to get culture tubes, and no examination of the pus was made.

¹ *Proc. Laryng. Soc. Lond.*, 1897, iv, p. 72.

Erosion or Deficiency of Nasal Bones in a Case of Multiple Nasal Polypi (bilateral) with Sinus Suppuration.

By HERBERT TILLEY, F.R.C.S.

MAN, aged 54. A probe passed into either nasal cavity can be easily felt under skin covering bony deficiencies. The man is a patient from whom, once yearly, several polypi have been removed, but the condition described above was noticed for the first time yesterday. No history of syphilis; no signs of malignant disease in nose.

DISCUSSION.

Mr. HERBERT TILLEY added that the man had nasal polypi with suppuration for many years, and there was a deficiency of bone in the region of the nasal processes of the superior maxillary bones—the deficiency was bilateral and about the size of a threepenny-piece. On the previous day he saw the patient for the second time this year, and thought that the lachrymal sac was inflamed. Closer examination, however, showed that the swelling was a puffiness of the skin just beyond the nasal bones. One could pass the probe up the nose and feel it under the skin covering the bony defects. He had not previously seen a similar case, and did not know whether it was due to slow erosion of the bone from within, or congenital.

Mr. CLAYTON FOX said that some years ago he saw a case of nasal polypi of very long standing, and when the polypi were removed they appeared to be fibroid. In that case there was a decided absorption of bone. It was unilateral, but in this case the absorption seemed to be symmetrical, and the parts absorbed were the ascending processes of the superior maxillæ.

Dr. KELSON said he showed a similar case in 1903, at a meeting of the Laryngological Society; the bone in that case was absorbed; there was not merely separation of the nasal bone—a finger could be well inserted into the cavity formed.

Dr. PATERSON said that as it was bilateral, the condition might be a congenital deficiency. But he thought the opening on the left side was distinctly larger, and this inequality suggested absorption from within.

Melanotic Sarcoma of the Nose.

By G. WILKINSON, F.R.C.S.

HISTORY: H. J., aged 52, presented himself at the Sheffield Royal Hospital on November 4, 1910, complaining of a "growth in the nose." He had suffered from frontal headache of moderate severity for two years. There had been an increasing degree of obstruction of the left nostril for eighteen months. For some months he had noticed a "substance" within the left nostril, and that the side of the nose was being "pushed out." There was no discharge until three months previously, since when it had been fairly copious, usually streaked with blood, but not offensive. There had been no severe bleeding.

On examination, a mass of growth of dark purple-brown colour was seen filling the left nasal vestibule, and pushing outwards the soft parts of the nose. The skin of the ala nasi was infiltrated, and infiltration of the tissues overlying the nasal process of the superior maxilla could be felt. By posterior rhinoscopy the nasopharynx was ascertained to be free, but the view within the choana was obscured by secretions. Left side dull to transillumination. No swelling of the orbit or bulging of the anterior or inferior walls of the antrum. No enlarged glands or pigmentation of the skin. Fundi normal.

A piece of the growth was removed by the snare for microscopic examination. Professor Beattie, of the Sheffield University, pronounced the specimen to be melanotic sarcoma.

Operation (November 16, 1910): Complete removal of the left upper jaw, together with the soft parts of the left side of the nose. The skin removed included that covering the ala together with a margin $\frac{1}{2}$ in. in width of the cheek and upper lip. The septum was found to be ulcerated where the growth had pressed upon it, at a point about $\frac{1}{2}$ in. within the vestibule. The mucous membrane was infiltrated and the cartilage eroded. Spots of black pigment were scattered in the mucous membrane all over the area of contact with the growth. All the mucous membrane was removed from the left side of the septum, and also the whole thickness of the septum for a distance of $\frac{1}{2}$ in. round the site of ulceration.

Subsequently a plastic operation was done to close the large gap in the face. The ala nasi was restored by a flap taken from the cheek. The wound failed to heal entirely owing to want of support to the flap

from below. A small hole, 6 mm. by 3 mm., remained between the ala and the cheek. A further plastic operation to close this defect failed in its object, and the patient is unwilling to have anything further done. The defect in the palate has been closed by a denture and obturator. The patient is now in excellent health and shows no sign of recurrence. There is, however, considerable deformity, owing to the deflection of the nose to the left and flattening of the tip due to the contraction of the gap in the cheek and side of the nose. The depression of the scar is also noticeable.

Examination after removal showed the growth to consist of three distinct portions: (1) A sessile firm outgrowth of rounded projections growing from the inside of the vestibule and side wall of the nose, measuring $1\frac{3}{4}$ in. from before backwards by 1 in. from above downwards. This had infiltrated deeply the soft tissues of the side of the nose and adjacent parts of the cheek and upper lip. The skin of the vestibule is deeply pigmented. (2) An elongated, smooth, shiny polypus of sooty black colour, springing by a slender stalk from the anterior end of the middle turbinal and extending backwards almost to the choana. This polypus lies completely free, except where attached by its pedicle, and has pushed the side wall of the nasal fossa outwards towards the antrum. (3) The contact infection of the septum, already described.

Histological structure: A section of the primary growth shows typically the picture of mixed-celled sarcoma. There is almost complete absence of stroma, and no appearance of alveolar arrangement. Bands of spindle cells partly enclose and partly merge into areas of round and polygonal cells. The cells are of all shapes and sizes. Their nuclei are large and exhibit signs of active division by mitosis, side by side with appearances of vacuolation and degeneration. The pigmentation is diffused throughout the specimen, varying in amount in different parts of the section. In cells in which pigment is present the granules are grouped around the nucleus, and when considerable in quantity the nucleus is degenerated. In many cases the cells are replaced by deposits of pigment. Very few blood-vessels are present, but plentiful blood-spaces between the cells. Where blood-vessels are seen the cells in their walls are deeply pigmented.

The appearance of the surface of the ulcer on the septum is similar to that of the primary growth, except that the pigment is mostly on the surface. Beyond the ulcer the mucous membrane shows no sign of infection, but seems to have absorbed pigment from the surface of the tumour. The pigment granules are deposited in the epithelial cells and submucous tissue.

Fibro-angioma growing from the Inferior Turbinal.

By G. WILKINSON, F.R.C.S.

THE growth was removed from the upper part of the right inferior turbinal, from near the posterior end, of a woman, aged 46, who had suffered from severe bleeding from the nose for six weeks. The patient was decidedly blanched. The tumour had a slender pedicle, and was removed with the snare. The base was thoroughly treated with the galvano-cautery.

Histological report, by Professor Beattie, of the Sheffield University: "The tissue is composed of spindle cells, with long processes, and numerous blood-vessels. There is a definite capsule. In parts, myxomatous tissue is abundant, with a good deal of blood. The general appearance suggests a soft fibroma, or slow-growing spindle-celled sarcoma."

The tumour appears to be of the same nature as the more common "bleeding polypus" of the septum, and similar to the specimen shown at the meeting of the Section in February last year by Mr. Somerville Hastings.

DISCUSSION.

Dr. PEGLER said this specimen would constitute a valuable addition to the Society's collection of these multiform growths. He saw no resemblance to Mr. Somerville Hastings's case, a section of which he had brought with him for comparison; the latter was made up of much looser tissue, grew from the anterior end of the turbinal, and was a smaller growth altogether. The present specimen was, in fact, a true nævoid fibro-angioma and seemed to be linked in affinity with the large fibro-angiomas of the nasopharynx. It had no true epithelial border, but was surrounded by a denser layer that might be organized blood-clot. The body was traversed by fibrous septa, some of which appeared in transverse section. The vessels were very small, but abundant, and not lined by endothelium. The usual fibroblasts in various stages of development were very conspicuous. A large part of the growth was literally saturated with freshly effused blood. Replying to the President, the speaker said he could think of no more comprehensive term for "bleeding polypus" than discrete nasal angioma, as it included septal, turbinal and alar examples, and he was pleased to see his synonym amongst those mentioned in Dr. StClair Thomson's recent work.

14 Lack: *Papilloma of the Palate in an Old Man*

Dr. KELSON said that in 1903 he showed a case of bleeding polypus which grew from below the inferior turbinate at the anterior end. When the President, Dr. StClair Thomson, in the following year showed two cases of bleeding polypus of the septum, he said he did not think his (Dr. Kelson's) case should be included, and that the bleeding polypus of the septum was an entity by itself, the pathology not having been worked out. He would like to know if, in the President's later opinion, those cases should not be all more or less classed together, or if, when the growth happened to be on the septum, the cases should be regarded as forming a separate class.

The PRESIDENT said that since the date to which Dr. Kelson referred, and after seeing his and Mr. Somerville Hastings's cases, he had modified his opinion. He had quoted both those cases in his book. It was suggested that the term "of the septum" should be discontinued, and that they should be known as bleeding polypi of the nose.

A Case of Papilloma of the Palate in an Old Man.

By H. LAMBERT LACK, M.D.

THE patient has an extensive papillomatous mass on the soft palate, chiefly on the right side. Clinically the disease might be mistaken for epithelioma or tubercle. This, in fact, was the case, until the microscopical sections had been made of a large piece removed from the edge of the growth.

Patient and microscopical section exhibited.

DISCUSSION.

Dr. H. J. DAVIS said that, in spite of the pathological report, he would regard the growth as malignant. He did not think it was possible to meet with a papilloma so extensive and diffuse, and yet of a simple nature.

Dr. DUNDAS GRANT said he had had a case which, in its early stages, almost exactly resembled the present one. It increased in extent and became more indurated. On microscopical examination of a portion of the more indurated part he found distinct signs of epithelioma.

The PRESIDENT asked how long Dr. Lack had had the case under his care, and what was the feel of the tumour. He had had a similar case in a man who was only 43 years old, and showed the case at the Medical Society of London as a papilloma of the soft palate. He had a drawing of it, which appeared in his book. It turned out afterwards to be malignant disease.

Dr. LACK replied that he had not seen the patient for two months. His original diagnosis was epithelioma; in fact, he took the patient into the hospital

with a view to operation. It was only when the microscopical sections were examined that it was found to be papilloma. The piece removed was not just a snip, but was a deep section cut right through the edge of the growth, involving much of the normal palate. No one who looked at the section could fail to recognize that it was certainly a papilloma.

The PRESIDENT requested Dr. Lack to report if there should be any further development.

Case of Ulceration at the Base of the Tongue.

By W. H. KELSON, M.D.

J. B., AGED 67, clock cleaner. No history of syphilis; lungs appear to be normal. For ten years the throat has felt uncomfortable. Four months ago it became definitely sore and painful on swallowing, the pain being situated in the throat and left ear. He also complains of the accumulation of large quantities of "slime" in the throat.

On examination: There is found to be a large crateriform ulcer situated at the base of the tongue on its left side; its edges and base are fairly hard and much thickened. The ulceration reaches down behind the left arytenoid. Points worthy of note are (notwithstanding the extensive character of the disease) the mobility of the tongue, fair movement of the left vocal cord, and apparently only slight glandular enlargement.

DISCUSSION.

Dr. DUNDAS GRANT thought no other diagnosis was likely except epithelioma.

Dr. DONELAN said he thought it was malignant, but asked if Dr. Kelson had had the opportunity of trying iodides and mercury, because the condition, although unilateral, was suspicious.

Dr. DE HAVILLAND HALL suggested that before trying antisyphilitic treatment it would be well to have a Wassermann reaction done.

Dr. KELSON, in reply, said the case reminded him very much of two cases which he saw about ten years ago at the Laryngological Society of London in which the diagnosis of malignant disease was made. There were large masses as in this case, but they turned out to be tuberculous. On that account he thought it was interesting to show the present case although he regarded it as malignant. The man had been given large doses of iodide, after which he was considered to be better, but apparently the improvement was not real. The Wassermann reaction had not been tried as he did not regard the case as at all likely to be syphilitic.

An Affection of the Fauces simulating Secondary Syphilis.

By W. H. KELSON, M.D.

ANOTHER of a series of cases brought forward by exhibitor¹ to illustrate an affection of the fauces simulating secondary syphilis and consisting of whitish patches on an inflamed base, on the tonsils and sometimes the palate.

The principal points noted about these cases are :—

- (1) There is no history of syphilis or any other sign of it to be found after careful search.
- (2) The disease tends to be chronic (over a year's duration noted), getting almost well and then reappearing.
- (3) The superficial character, leaving no cicatrices, and the nose and larynx unaffected.
- (4) Antisyphilitic remedies have no effect whatever.

DISCUSSION.

Mr. CLAYTON FOX said he did not find much wrong, but from the description set forth one should consider the possibility of the case being one of chronic Vincent's angina, although that affection usually cleared up rapidly. Still, cases had been known which became chronic. From the point of view of diagnosis it would be all-important to know what the onset was like, if the patient had fever and the other ordinary concomitants.

Dr. BROWN KELLY said he had met, in quite a dozen patients, with a condition of fauces resembling that described by Dr. Kelson. The uvula, faucial arches and the upper part of the faucial pillars presented a milky appearance; usually this was slight and as if produced by silver nitrate; in marked cases it was very like that of mucous patches. There was no erosion in any of the cases. The white appearance was probably due to the taking of alcohol by the patient prior to examination. Of his cases all but one were in men, and in the case of the woman she had been indulging in whisky. In some patients the appearance persisted, but in others it was transitory. One young man who had had six whiskies and sodas just before seeing him, and in whom the appearance was marked, presented no trace of it in three days. The fact that the posterior surface of the uvula was unaffected supported the view that it was due to intracellular changes resulting from direct irritation.

¹ Vide *Proc. Laryng. Soc. Lond.*, 1903-4, xi, p. 149; 1904-5, xii, p. 127.

Mr. CYRIL HORSFORD thought the opportunity a favourable one to describe a case which had been most instructive to him, one which should be known to laryngologists if they did not happen to have seen a case of the kind, especially as the description of the present case suggested to him that it might be a mild form of the same disease. The disease in his case turned out to be acute pemphigus. It commenced on the fauces, where there were white patches, looking like mucous patches of secondary syphilis. Both tonsils were affected, and after lasting there several weeks it spread to the palate and the inner parts of the cheek corresponding with the tooth region. The theory first put forward was that the state of the mouth was due to the use of an irritating tooth powder, but that idea was soon dispelled because later—i.e., in a few weeks—typical patches of pemphigus developed over the body. It was a very severe case, and the man eventually died of acute pemphigus, the disease having become generalized. He watched the patches on both tonsils for some weeks, until the further progress of the case revealed its nature. They were not benefited by any treatment. Pneumococci were found in cultures from the mouth and skin bullæ.

Dr. W. HILL asked if, in Dr. Kelson's series of cases, tobacco was a possible cause, or if he had been able to eliminate it as a factor.

Dr. DAN MCKENZIE said he had seen two or three cases similar to that described by Dr. Kelson. One of the cases was that of a young woman in whom there was no possible likelihood of any alcoholism, or anything of that nature. At first he thought it was secondary syphilis, as the similarity was so close, but ultimately he concluded it was a chronic inflammatory condition, and the event proved that that was so, for it cleared up without antisyphilitic treatment. It seemed that almost any form of chronic inflammation of the neighbourhood of the fauces might, under certain circumstances, give rise to such an appearance. But there could be no doubt, in spite of the case he had just mentioned, that an irritant such as alcohol might in many cases be the cause.

Dr. KELSON, in reply, said that, years ago, when he had the advantage of doing work with Dr. Laek, at Golden Square, that gentleman emphasized the value of recognizing very early secondary syphilis in the throat by a very faint white milky look on the tonsil, with a very slightly reddened base. It was so faint that many people looking at the throat would not notice anything wrong. But the cases in which it was seen turned out to be the beginning of secondary syphilis. He had held this view until he saw the first of the cases now referred to, which looked exactly the same, and it was for this reason that he brought the case forward. With regard to the bacteriology, this case had not been examined from that point of view, but the others had been, and no Vincent's bacilli or other special organisms were found. With regard to the possibility of tobacco being the cause, some of the patients had been females who did not smoke, so obviously it could occur without smoking. As he had no suspicion of syphilis the Wassermann reaction was not tried.

Case of Laryngeal Tuberculosis.

By JAMES DONELAN, M.B.

GENTLEMAN, aged 44. First seen in January, 1908. Shown in this Section in May, 1909, and June, 1910. A bad case of secondary tuberculous laryngitis, affecting chiefly the epiglottis.

Treatment has consisted chiefly of cauterizations by electro-cautery and various antiseptic sprays, such as guaiacol. Silence for two years. Internally, guaiacol until a year ago.

Had about forty cauterizations. The condition has been stationary for now nearly twelve months, except that three months ago a small focus appeared on surface of epiglottis and was cauterized. No change has taken place in state of arytaenoids or interarytaenoid space for the past three years.

The pulmonary condition, affecting chiefly the right side, is also stationary. Patient's temperature, which has always been subnormal since he has been under observation, has shown a tendency to approach the normal since he has been able to resume work, and his outlook has become more hopeful.

The case is shown as Dr. Donelan had been requested to try a course of new tuberculin, but the patient now hesitates lest it may, as he thinks, start up a violent reaction both pulmonary and laryngeal. The opinion of members is requested on the case and especially this point.

DISCUSSION.

Dr. DONELAN added that it was a question whether it would be advisable to treat by means of the galvano-cautery or with the new tuberculin. He considered that the patient was doing very well; he was still, five or six years after he had been condemned as incurable, living and getting about, the laryngeal condition was improving gradually, and he did not think much more could be done. The disease was, he thought, confined to the epiglottis, and the opinion expressed last year was that he should not remove the epiglottis but treat by means of the electro-cautery. The condition appeared to have been stationary for the past twelve months; there had certainly been no change in the appearance of the arytaenoids.

The PRESIDENT said the case was a long-standing one, and, as far as he could see, only the epiglottis was affected. He differed from Dr. Donelan

in that he did not think the patient had done well. He had had over forty applications, and he (Dr. Thomson) had never seen an epiglottis so resistant as this. It was a very chronic case, and one of the kind which he suggested might be called lupoid tuberculosis, because the usual tuberculous epiglottis did not last over two years without causing distinct distress, whereas this patient had no distinct discomfort in swallowing, and there was very little phlegm. He asked Dr. Donelan if he applied the cautery at almost white heat, and if he burnt down as far as it would go until it reached healthy tissue. If that had been done, he thought that the epiglottis would have cicatrized and shrivelled up and been reduced to a non-ulcerating stump in six or possibly in three months.

Dr. WATSON-WILLIAMS suggested that if tuberculin was tried it should be "P.T.O." first. But he thought that a very satisfactory way of dealing with this patient's epiglottis would be to remove it *en masse*.

Dr. DUNDAS GRANT said that if the patient had any definite discomfort, it was a case on a par with those which Mr. Hett described at Birmingham,¹ and the epiglottis might be removed. But he thought it would be a pity to risk bringing on any reaction, as he was going on so well.

Dr. DONELAN, in reply, said he proposed to carry out the President's suggestion of applying the cautery nearly white hot and burning down deeply, if the patient would consent. At present there were very few tubercle bacilli in the sputum, and the lungs were going on well. Three months ago, however, a tiny point was evident on the left side of the epiglottis. The thickening now seen appeared to consist almost entirely of cicatricial tissue.

Multiple Sinusitis in a Woman, aged 45.

By JAMES DONELAN, M.B.

PATIENT suffered from left intranasal suppuration following influenza. Admitted to Italian Hospital in October, 1907. Anterior portion of left middle turbinal removed. As no improvement followed, in November the left maxillary antrum was opened by the angular trocar and chisels shown. Recovered completely and kept well until autumn of 1909, when she again got influenza with marked inflammation, apparently of all the left sinuses. The frontal was opened in October, 1909, and with the fronto-ethmoidal and ethmoidal cells was curetted and drained by Killian's method.

Patient remained well through the winter, but in the spring of 1910 had renewed frontal inflammation. The sinus was fully opened again

¹ Brit. Med. Journ., 1911, ii, pp. 1007-11.

20 Wylie: *Case of Paralysis of the Right Vocal Cord*

and drained, and in replacing the periosteum it was laid into the cavity. Several ethmoidal cells were dealt with on this occasion and at several sittings under local anaesthesia. Patient remained apparently quite well until September, last year, when she again suffered from severe pain in the brow and intermittent discharge from the fronto-nasal duct. An incision was made again through the left eyebrow, but as the frontal sinus was found obliterated by solid bone at a depth of 7 mm., the re-opening was abandoned. The pain, which was probably due to implication of the supra-orbital nerve in the cicatrix, ceased, and the intranasal discharge stopped soon after the fronto-nasal duct was cleared of granulations. A few ethmoidal cells were curetted in September, 1910, and the patient has now remained quite well (but for a cold caught a few days ago) for over twelve months.

Dr. DONELAN explained that the chief point in the case was that the frontal sinus was opened three times, twice fully. At the second operation the periosteum was carefully turned in, and later the patient was admitted into the hospital on account of fresh symptoms. For a distance of 7 mm. it was filled with solid bone, and the case was like one in which the mastoid was almost completely renewed by re-growth of bone after operation. He had not had a skiagram taken, but judging by the resistance to the hammer and chisel, so far as it had been traversed, it seemed probable that it was solid. The patient had made an excellent recovery.

A Case of Paralysis of the Right Vocal Cord, with an Affection of the Third, Sixth, and Tenth Motor Cranial Nerves.

By ANDREW WYLIE, M.D.

H. R., MALE, aged 24, cabinet maker. Has been under the exhibitor's care since September 12, 1911. He was knocked down by a cart five years ago. Was unconscious for twelve hours. Laid up in bed for two weeks and then returned to work, and for a year was fairly well. Then his right eye became affected. Double vision has occurred intermittently ever since. Was treated at King's College Hospital for ophthalmoplegia of the right eye. No history of specific disease. No headache. Occasional nocturnal vomiting.

Dr. Purves Stewart's and exhibitor's report of the condition of the patient is as follows: Optic disks practically normal. Right-sided ptosis with severe external ophthalmoplegia of the right eye, but not complete.

Right globe can be moved 1 mm. up, down, in and out. Left eye can be moved well outwards, but the inward, upward, and downward movements are deficient; thus all the external ocular nerves are affected except the left sixth. The right ptosis is part of the palsy of the right third nerve. Both pupils react to light. Patient cannot converge, so that the reaction to accommodation cannot be satisfactorily tested. The masseters and temporals are powerful. There is a curious weakness and wasting of most of the facial muscles. The orbiculares oculorum are both excessively weak. The orbicularis oris is practically completely paralysed, so that the patient cannot whistle, blow out the cheeks, nor purse up the lips. The palate moves moderately well, but the voice is nasal, and there is frequent nasal regurgitation. The right vocal cord is fixed. The tongue is somewhat small, but moves freely in all directions, and is free from fibrillary movements. The sterno-mastoids, trapezii, and all the muscles of the upper limbs, trunk, and lower limbs are normal. The reflexes are normal in all the limbs. The facial muscles show a marked diminution to faradism, in particular the orbicularis oris does not react at all. The masseters and the tongue muscles react briskly to faradism. To galvanism the reactions in the face are simply diminished without polar changes.

Dr. Wingrave reports the Wassermann test negative.

An example of the cerebrospinal fluid has not yet been taken.

The case is very unusual and is suggestive of a combination of myopathy of the facial muscles with an affection of both thirds, the right sixth and the right tenth motor nerves.

DISCUSSION.

Dr. DUNDAS GRANT asked if in this interesting case it was certain that the disease started as the result of the injury. He asked the question because it seemed a long interval between the accident and the development of the symptoms.

Mr. CLAYTON FOX said he thought the case was of more interest to the neurologist than to the laryngologist. The lesions were so far apart with regard to the nuclei that it seemed probable that it was a case of sclerosis of the nuclei.

Dr. WYLIE, in reply to Dr. Grant's question, said the patient got better after his injury. It was a year since he had symptoms, and iodide of potassium and mercury produced no improvement. He was only six weeks under treatment, and he brought the case hoping to hear suggestions *re* source of lesion and treatment.

Case of Lingual Thyroid.

By GEORGE BADGEROW, F.R.C.S.Ed.

IN May last patient noticed a swelling in the tongue; the throat seemed dry. She has no difficulty in swallowing, breathing, and eating. It does not seem to be getting any larger.

DISCUSSION.

Dr. BROWN KELLY suggested that it was a cyst. If it was the intention of Mr. Badgerow to treat it, and in case it might turn out to be thyroid tissue, he advised that the incision be made with caution, as it might be followed by grave hæmorrhage.

Mr. WESTMACOTT regarded it as a retention cyst of the upper end of the thyro-lingual duct. It was more like this in colour; it felt soft, as if it contained fluid.

Mr. HARMER asked if Mr. Badgerow thought the patient had a normal thyroid in front of the trachea.

The PRESIDENT said that in his opinion such cysts in front of the neck were best left alone unless they became unsightly.

Dr. FITZGERALD POWELL was decidedly of the opinion that the condition should not be interfered with unless it was causing trouble; he should leave it alone.

Mr. BADGEROW, in reply, said he showed the case in order to ascertain whether there was any thyroid in the tumour. Some of the members thought the tumour was soft, but he did not think so, but rather that it was firm. Possibly it was a cyst. A physician, who had had several cases of the kind, had expressed the opinion that there was no thyroid tissue in the tumour.

Cyst of Ary-epiglottic Fold.

By GEORGE BADGEROW, F.R.C.S.Ed.

PATIENT has some difficulty in breathing and swallowing; also complains of hoarseness.

The PRESIDENT said he had a case of cyst of the ary-epiglottic fold in a lady singer, a professional. He had not told her it was there, and she was not aware of the fact. It was on the pharyngeal surface.

Swelling in the Neck in a Child, aged 4½.

By GEORGE BADGEROW, F.R.C.S.Ed.

FIRST noticed the end of August, 1911; it was then the size of a small egg. It is a translucent, elastic swelling, with an impulse on coughing, moves a little on swallowing. This last week it has got much larger. The exhibitor invited opinions as to treatment.

DISCUSSION.

Mr. CLAYTON FOX said that when he first examined the case it seemed to him to be one of pneumatocele. He thought he could displace the whole of the tumour into the larynx. On further examination he found that he was displacing fluid into the lateral parts of the neck. From its position and mobility with the larynx during deglutition, he thought it was either a cyst of the thyro-glossal duct, or one arising from a diverticulum of the ventricle, as described by Mr. Bland-Sutton, most probably the latter.

Mr. WESTMACOTT did not consider that the tumour was in the position of the thyro-glossal duct; it was too low down and to one side. In his opinion it was more like a cystic bronchocele. The right lobe on examination was found to be hard and larger than it should be for a child of the age of this one.

Dr. FITZGERALD POWELL said the tumour did not move sufficiently, in his opinion, on swallowing to be a cystic bronchocele; he thought it was a cystic hygroma.

Mr. HARMER agreed that it was hygroma. If it was known to be growing he would remove it, but it might be difficult to get away because it tracked among the main vessels.

Dr. DAN MCKENZIE said that some years ago he had shown a similar case before the Society for the Study of Disease in Children, but the patient was much younger, six months old. The interesting point was that the tumour gradually disappeared spontaneously. He thought in the present case the possibility of a similar disappearance should be kept in mind, especially as dissection of it would involve a considerable laying bare of deep structures in the neck. The tumour, cystic in front, passed under the sterno-mastoid and could be felt in the posterior triangle, where it was semisolid. His opinion was that the tumour undoubtedly was a cystic hygroma.

Dr. PATERSON called attention to the extreme softness of the tumour. Probably it had been present some time, bound down by the deep fascia, and when it had pierced this it enlarged suddenly and extended. In the last two

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or three years he had had two cases very similar, and it was necessary to make a very extensive dissection in order to remove the tumour completely. It was like a bag of fluid, and, as Mr. Harmer suggested, was probably related to a hygroma. Recently a paper by Mr. Morton had appeared in the *Bristol Medico-Chirurgical Journal*¹ on cysts in the neck, which was presented rather higher up under the angle of the jaw. The suggested origin was a branchial cleft, and the speaker had experience of one or two such cases.

Mr. BADGEROW, in reply, said he agreed with those who believed it to be cystic hygroma.

A Case of Ulceration of the Left Ala and Vestibule of the Nose.

By W. JOBSON HORNE, M.D.

THE patient, a man aged 28, always subject to bad colds, sixteen days before this note was written, experienced soreness of the nose, and applied various ointments without relief. Eight years ago he had lumps in the right groin, and two years ago he was treated for some form of penile disease. During the last two or three years he has had cough, and about three weeks ago he was told that he had a patch of pleurisy, which he located below the right clavicle. There is no family history of phthisis, and further tests for syphilis and tuberculosis had not been carried out.

DISCUSSION.

Dr. DUNDAS GRANT said his impression was that this destruction of the ala of the nose was the result of a rupial syphilitic change coming on, as these did, before the usual time for tertiary symptoms to show themselves, and that this would explain the penile trouble, which was not a sore but a discharge, and probably a case of intra-urethral chancre.

Dr. KELSON said he thought it was a typical tertiary syphilide.

The PRESIDENT remarked that he had had a similar case some years ago, before the discovery of the Wassermann test; in that case the most active antisyphilitic treatment did not succeed in arresting the disease. The man lost his nose and part of his cheek, and then he lost sight of him. At the Laryngological Society, Dr. McBride showed some cases of pernicious ulceration on the nose, spreading to the face, which were not amenable to anti-syphilitic treatment.

¹ *Bristol Med.-Chir. Journ.*, 1911, xxix, pp. 160-63.

Two Cases of Carcinoma of the Œsophagus ; Lower Thoracic
with Superadded Pharyngeal Dysphagia ; ? Paretic or
Spasmodic.

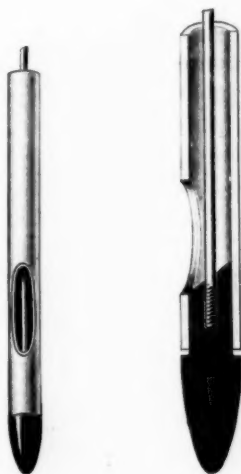
By WILLIAM HILL, M.D., and C. W. M. HOPE, F.R.C.S.

Case I.—Female, aged 54. Under treatment by intubation.

Case II.—Male, aged 54. Intubation temporarily discontinued.



Hill's oro-oesophago-gastric intubation apparatus for stricture in situ ; the method of attachment to the teeth or to a denture is not shown in detail.



Distal extremity of Hill's oro-oesophago-gastric intubation apparatus ; showing flexible silver style screwed into vulcanite nose-piece, with sunken portion for attachment of rubber tubing and orifice for passage of fluids (both enlarged).

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The special points of interest common to these two cases are as follows :—

- (1) The stricture commences 32 cm. (12½ in.) from the front of the alveolar margin—i.e., well below the bifurcation of the trachea.
- (2) Solid food is arrested in the deep pharynx, and does not enter the mouth of the oesophagus, though these regions are not invaded.
- (3) There is double abductor paresis in each case.
- (4) There are no malignant glands in the neck.

Arrest of solid food above the mouth of the gullet is not uncommon in the later stages of carcinoma low down the oesophagus, and (when not obviously due to local tumefaction or to enlarged cervical glands) is usually attributed to reflex spasm. There is, however, no more evidence of spasm than there is in favour of paresis of the deep pharynx, and the associated abductor paresis present in each case seems to suggest that the paresis or atony theory may probably be the true explanation. The experiences and opinions of members are invited in order to elucidate this curious complication.

DISCUSSION.

Dr. HILL added that the movements of the cords varied very much. On one occasion when the cords appeared not to move on abduction, the patient had been cocaineized for oesophageal examination, and that might have made the patient appear to have more paresis than to-day. But both the patients had had marked paresis at some time or another of the abductor muscles, and the food always stuck in the pharynx, although the actual malignant stricture lesion was low in the gullet. Under those circumstances he would be glad to know why the food should stick in the deep pharynx if not from paresis, whether functional or organic.

Dr. BROWN KELLY said the tendency for food to stick at the upper end of the gullet was not uncommon in oesophageal disease, and might occur independently of involvement of the recurrent nerve. Therefore he thought one might leave out of account paresis as a cause. In the two cases shown anaesthesia might conceivably play a part, for when the laryngeal nerves were affected there was anaesthesia of the entrance to the larynx, which would involve the posterior surface of the cricoid, and so might hinder deglutition. But, on the other hand, in cases of pure laryngeal paralysis, there was no dysphagia, so that anaesthesia was probably a negligible factor also in the cases under discussion. One was thus driven to regard spasm as the cause of the difficulty. Why should it not be? Spasm occurred in other parts of the body, why not in the oesophagus? How else could one account for the difficulty in swallowing in hysterical patients, or when a foreign body, too small in itself to fill the lumen of the oesophagus, caused complete blockage?

Further, patients with carcinoma at the cardiac end of the œsophagus often referred their dysphagia to the cervical region, and in others with cancer at any level in the œsophagus the first symptom was sometimes sudden inability to swallow, which after lasting a variable period passed off almost completely. Finally, in so-called cardiospasm paresis might ultimately be shown to play an ætiological rôle, but in the meantime the old explanation of spasm as a primary cause could not be set aside. On these grounds, therefore, he considered spasm to be a common complication of œsophageal disease, and to be the probable cause of the condition to which Dr. Hill had drawn attention.

Dr. DUNDAS GRANT said this reflex spasm had been known to occur as the result of disease in the abdomen, and actually from disease of the liver. Sir Stephen Mackenzie, years ago, published cases of the kind. Dr. Grant had had one himself, which he made the subject of a letter to the *Lancet*, when he was in general practice, many years back. There was, in that case, spasm in the upper part of the œsophagus, and at that time there was difficulty in introducing a tube down the œsophagus. The spasm was not to be explained by any narrowing in the œsophagus, and the patient ultimately died with symptoms of cancer in the liver. No post-mortem examination was obtained. He had later a case which was sent to the London Throat and Ear Hospital in which great difficulty was experienced in passing a bougie. He referred it to Mr. Mayo Collier, who was very anxious to have cases of obstruction of the œsophagus for gastrostomy, and he found that there was cirrhosis of the liver, which seemed to have accounted for the spasm in swallowing. It appeared that spasm in the upper end of the œsophagus might occur from disease away from that locality.

Mr. WAGGETT spoke of the absence of active peristaltic action observed in some cases of malignant disease of the œsophagus.

Dr. DAN MCKENZIE, referring to the conditions mentioned by Mr. Waggett, said that the absence of the normal passive dilatation of the gullet in cases of low-lying cancer, when the œsophagoscope was inserted, clearly proved the presence of spasm. Everyone was familiar with the fact that in health the gullet ballooned out when the tube had passed the superior constriction. When, therefore, ballooning did not take place—as in many œsophageal diseases—there must necessarily be spasm.

Dr. FITZGERALD POWELL said it would be interesting to know if the paresis of the vocal cords was present before the instrument was passed. It was known that the passage of the old form of bougie had caused such paresis before. Any instrument passing against the cricoid might cause it. With regard to spasm as a result of liver disease, he thought it might be accounted for by the fact that the veins in the cardiac end of the œsophagus were often dilated in cirrhosis of the liver.

The PRESIDENT said he had had cases of spasm of the œsophagus and functional dysphagia due not only to the cause mentioned, but also to cirrhosis of the liver. In another case, in an elderly man, it was due to trouble in the teeth. When the pyorrhœa was got rid of the spasm ceased.

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Dr. HILL, in reply, said that in these cases, where the dysphagia was referred by the patient to a spot remote from lesion and, as in this case, higher up, he had (as the result of radiographic and other means of observation) been compelled to abandon the reflex spasm theory and fall back on paresis as the more probable explanation. The bougie did not help in the differentiation, because mere spasm in the deep pharynx—i.e., behind cricoid—could be overcome by the bougie. When the food stuck in the pharynx and did not enter the œsophagus, it was found by X-ray screen observations that there was atony rather than spasm, as there was no effort made to pull the larynx upwards and forwards and away from the spine by the muscles passing from the tongue to the hyoid bone and larynx; in genuine spasm these muscles would contract and endeavour to overcome the alleged opposing spasm of lower sphincter fibres of the crico-pharyngeus (inferior constrictor). The dysphagia therefore *was seen* to be due, not to an inco-ordinated spasmodic act of deglutition, but to mere paresis. The associated laryngeal paresis, in these cases, was also strongly suggestive of pharyngeal paresis rather than of reflex spasm. Spasm did undoubtedly occur as a secondary or symptomatic phenomenon at the site of an inflammatory stricture, or when a foreign body was impacted, but this could be demonstrated by the X-rays, when reverse peristalsis would be observed. Primary idiopathic spasm and reflex spasm, where there was no adjacent lesion, had never been found by him (Dr. Hill), when really carefully looked for by radiographic and endoscopic methods of investigation, and he had, it must be remembered, performed several hundred œsophagoscopies and he had been compelled to abandon the prevailing view which Dr. Brown Kelly subscribed to. Theoretic misconceptions had led to the general belief in sphincter spasm in the gullet; as a matter of fact there was no sphincter band to be found anywhere in the œsophagus. As regards atony—i.e., paresis of the œsophagus—to which Mr. Waggett had alluded, it was no doubt present as a secondary phenomenon in a dilated gullet. Collapse of the gullet—i.e., absence of lumen during œsophagoscopy without dilatation—pointed to tumefaction rather than to pure atony. Movements in the gullet affecting the lumen were the result of respiratory movements of the trachea and diaphragm and were also due to associated negative pressure in the lungs during inspiration. A paretic gullet with no tumefaction would open up and partially shut with respiration—i.e., with variations in intrathoracic pressure—in exactly the same way as a gullet with normal tone. Absence of lumen almost invariably meant tumefaction or extrinsic pressure. He agreed with Dr. Powell that in hepatic cirrhosis there was tumefactive engorgement of the gullet and stomach, not mere spasm. He had discussed, from the evidential point of view, the question of the frequency, or otherwise, of primary idiopathic spasm of the gullet, at the Birmingham Meeting of the British Medical Association,¹ and had come to the conclusion, on a priori and on anatomical grounds and as the result of extensive endoscopic and radiographic observations, that it was usually, if not always, an error of diagnosis.

¹ *Brit. Med. Journ.*, 1911, ii, p. 920.

Epithelioma of the Ventricular Band in a Man, aged 36.

By J. DUNDAS GRANT, M.D.

E. L., AGED 36, was first seen on September 6, when he complained of soreness of the throat with some pain in swallowing. This had started suddenly four months before and had gradually increased in severity. The voice was husky and there was some pain on utterance; there was a cough, which was more marked in the morning. On laryngoscopic examination there was found a moderate general infiltration of the right ary-epiglottic fold concealing the right ventricular band and almost hiding the vocal cord; the inner aspect of the ary-epiglottic fold and posterior and outer part of the ventricular band were occupied by an irregular oval ulcer of very moderate depth, with a pale granular floor. At first sight the appearance was suggestive of tuberculosis, but its unilateral character and the absence of tubercle bacilli negated this. Wassermann's reaction was negative, and no improvement followed the administration of iodide of potassium. A small portion from the floor of the growth was removed for microscopical examination and Dr. Wingrave reports as follows: "It is very suspicious, the epithelium being greatly thickened, irregular in size, shape and grouping. It shows a great tendency to spread inwards and to form 'pearls.' There is also considerable lymphocytic infiltration. It may be granulomatous, but the epithelial activity is so marked that it is strongly suggestive of early malignancy."

The specimen is now under the microscope and opinions will be welcome as to the nature of the growth, and, in case of its being almost certainly epitheliomatous, the method of dealing with it. The exhibitor's intention is to perform laryngo-fissure with the understanding that, if when this is done he finds the growth to be too extensive to eradicate without the removal of half or more, probably the whole, of the larynx, the complete extirpation is to be permitted. He is inclined to think that nothing short of this will suffice.

DISCUSSION.

Mr. TILLEY said he had not seen the slide, but he had carefully examined the man's larynx, and he could not help thinking the disease was tuberculous. If there was an ulcer on the ventricular band of malignant nature that ulcer was probably only the visible evidence of a deeper infiltration which would fix

the cord more than in this case. The right cord did not seem in any degree hampered in its movements. He thought the œdema of the arytenoid was inflammatory, and that, in spite of the verdict from the microscopic slide, he believed it would turn out to be a tuberculous infection of the larynx.

Dr. JOBSON HORNE asked when the portion was removed for microscopical examination. [Dr. GRANT: Ten days ago.] It made it difficult to give an opinion at the present time, as one was now looking at the results of that trauma. One should arrive at a diagnosis of malignant disease of the larynx by eliminating tuberculosis and syphilis as factors by the usual clinical tests. Dr. Horne further suggested that transillumination¹ of the larynx in the manner he had described would be of service.

Dr. H. J. DAVIS regarded it as early commencing tuberculosis. The only feature against this seemed to be that the right arytenoid did not move as easily as the left. It was easy to examine the patient, whereas in cases of malignant disease patients were, as a rule, intolerant.

Mr. TILLEY said he regarded this as pre-eminently the type of case which could be so usefully considered by the Section, and the whole value of it would be lost unless it were brought up again. He hoped Dr. Grant would, at a future meeting, acquaint the Section with the further progress of the patient.

Dr. GRANT, in reply, said the appearance under the microscope was not what one would have expected from the floor of a tuberculous ulcer, and, moreover, there were no tubercle bacilli. The Wassermann reaction was negative, the patient was not improved at all by iodide of potassium, and there seemed to be a great infiltration with epithelial cells. At first his diagnosis was tuberculosis. The unilaterality, along with the extent, was somewhat against tubercle and in favour of specific disease, but the Wassermann test being negative seemed to put that out of court. The ulcer was extending, and its edges were apparently beginning to be everted: the microscopical appearance, with the facts he had mentioned, appeared to leave no alternative.

Case for Diagnosis.

By W. DOUGLAS HARMER, F.R.C.S.

H. F., AGED 46. History of sore throat and nasal discharge and inflammation of left eye since June, 1911. In July, when first seen, extensive pyorrhœa, profuse discharge from both nasal cavities, membranous in character. Superficial ulcers covered by adherent membrane on fauces, palate, tonsils, pharynx, lips and cheeks. Membranous

¹ "The Differential Diagnosis of Tuberculosis, Syphilis and Malignant Disease of the Larynx," *Brit. Med. Journ.*, 1907, ii, p. 958.

deposit in conjunctival sac of left eye. Multiple shotty glands in anterior and posterior triangles of neck, also epitrochlear glands. Wassermann negative. Bacteriological examination: No diphtheria bacilli, no spirochaetes, no definite infection discovered. Shortly afterwards acute facial erysipelas developed. One month later left eye developed panophthalmitis which necessitated evisceration.

Present condition: The mouth, lips, cheeks, tongue, fauces, epiglottis and nasal passages are still affected. External sores on nose and eyelids. "Essential shrinking" of conjunctival sac. Differential count of leucocytes: Total leucocytes, 15,000. Polymorphonuclears, 77.5 per cent.; lymphocytes, 18.5 per cent.; large mononuclears, 1 per cent.; transitional cells, 2 per cent.; *eosinophiles*, 0.5 per cent.; basophiles, 0.5 per cent. General health fair, no diarrhoea.

Patient has been seen by Dr. Adamson, who was of opinion that the lesions were either of streptococcal infection or pemphigus. On the whole, he was inclined to favour the former.

DISCUSSION.

Dr. H. J. DAVIS said that his first idea was that the case was one of pemphigus, but subsequent reflection modified his view.

Dr. PATERSON said that in the last year he had seen a case which made him inclined to revise his prognosis in all such cases, as that prognosis had been in the past very serious. It was a case which had gone on for three years, and in which the condition ultimately disappeared. It was true that it was confined to both cheeks, but it was very definite pemphigus of the mucous membrane of the mouth and of the epiglottis, and on one occasion he was able to see a little bulla on the epiglottis before it burst. The case was now not only well, but there had been no sign for the last nine months. The affection did not involve the skin or the eye, and in that respect differed from the classical type.

Dr. WATSON-WILLIAMS asked what steps had been taken to determine the bacteriological condition associated with the ulcers. The appearances were so suggestive of pemphigus that he thought one could not exclude it unless there was more conclusive evidence that streptococci or staphylococci were causing the ulcerations.

The PRESIDENT remarked that he had had under his care for one and a half years an old gentleman with pemphigus, and he would be surprised if he continued to live long. He had already lost one eye from the disease, which affected the arytaenoids, the epiglottis, and the sides of the fauces. Arsenic had been given, but nothing seemed able to arrest the disease. He had seen one case recover.

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Mr. HARMER, in reply, said the lesions of the skin were, in his opinion, not absolutely typical of pemphigus. Dr. Adamson, who also saw the case, was of the same opinion. That gentleman considered that the skin affection was most likely streptococcic. It started in the nose, affected the throat, and then extended to the eye, which it destroyed, so that it had to be removed. The general health was now becoming affected. He proposed to vaccinate him, in order to see if some improvement could be brought about. If so he would show the man again.

Tracheo-laryngostomy for Traumatic Laryngeal Stenosis.

By WILLIAM HILL, M.D.

THIS girl, aged 8½, had been shown on April 7, 1911, an extensive tracheo-laryngostomy having been performed six weeks earlier, as the prolonged wearing of an intubation tube had failed to give permanent relief, the stenosis recurring after a few days' removal of the tube. The ostium in the neck is now considerably shorter than when previously shown, but the stenosis has apparently been cured in its lower three-fourths—i.e., in the crico-tracheal region—and on removal of the rubber tube the day previously there appeared to be a sufficiently patent though irregular glottic region. The patient could still breathe with the cervical ostium closed, but the glottic opening was considerably reduced as the result of leaving off the use of the rubber tube for twenty-four hours, and it would have to be replaced. It was a question whether the cervical ostium could not now be closed and a large intubation apparatus worn for a further prolonged period to try and effect a permanently open glottis. The alternative appeared to be to extend the laryngostomy upwards, remove redundant tissue and go on as before, endeavouring to keep the thyroid alæ widely apart with the winged rubber tube.

[Members who examined the case appeared to be about equally divided as to which was the better course; but Dr. Hill was encouraged to persevere in his endeavours to get rid of the remaining glottic stenosis by either or both methods.]

Dr. HILL said that the passage was now well open below—i.e., in the tracheal cricoid regions; the glottic region, however, was not satisfactory that day, the tube having been out for twenty-four hours. The patient could breathe well the day before with the tube out, and the ostium in the neck covered with wadding. It seemed as if it would be necessary to resort to the tube again, and he was considering the question of further operation by thyro-fissure and extending the laryngostomy upwards before falling back on intubation.

Laryngological Section.

December 1, 1911.

Dr. STCLAIR THOMSON, President of the Section, in the Chair.

Pedunculated Intrinsic Growth of Larynx in a Man, aged 41.

By J. EVERIDGE.

THIS case was shown at the last meeting.¹ A coloured drawing of the condition was shown. The growth was removed, and a section shown under the microscope proved it to be a granuloma.

The PRESIDENT (Dr. StClair Thomson), in answer to Mr. Tilley, said it was removed by the indirect method—the one still usually employed in Killian's own service.

Three Cases of Syphilis of Special Interest, two of the Soft Palate and one of the Tongue.

By W. JOBSON HORNE, M.D.

Case I.—A man, aged 43, twenty-five years ago contracted syphilis. In July, 1911, he attended at the hospital on account of deafness. The posterior pillars of the fauces presented very symmetrical perforations, quite healed and quiescent. The special interest of the case to the members of the Section was that several cases of perforation of the soft palate and of the pillars of the fauces had been brought, from time to

¹ See *Proceedings*, p. 5.

time, before the Section, and had given rise to a difference of opinion as to whether the condition was specific, congenital, or left by scarlet fever. Further points of interest in this case were the absolute symmetry of the perforations; their occurrence in the posterior pillars, the anterior pillars not being affected; and, lastly, a definite history of syphilis.

Case II.—A woman with ulceration, threatening perforation of the anterior pillars of the fauces. The interest in this case was the comparison with the previous one and in it presenting the appearances of the early and destructive stage. The patient, however, had so rapidly responded to treatment that perforation had been averted and the clinical appearances had almost entirely disappeared.

Case III.—A woman, aged 30, who attended the hospital in November on account of a swelling each side of the throat. On the right side of the posterior part of the tongue there presented a breaking-down gumma with heaped-up edges of a crater-like appearance. This case also had rapidly responded to treatment and thereby its clinical interest was in some measure lost.

DISCUSSION.

The PRESIDENT said the curious point was the perforation in the posterior pillars; it was the first time he had seen this. There had been a difference of opinion as to whether the condition was specific, congenital, or left by scarlet fever.

Dr. WATSON-WILLIAMS reminded members that some years ago he described and illustrated a case in the *Lancet*¹ with symmetrical perforations of the anterior pillars, and the absence of any appearance of cicatrices seemed to leave little doubt that the condition in that case was congenital. Probably scarlet fever or other ulcerative affections of the fauces produced a somewhat similar condition.

Dr. KELSON said there was some evidence in favour of it being specific. The man said that he suffered from sore throat when a child, and that the treatment in hospital was by calomel vapour. Also he had some serious affection of his eyes when he was 14 years of age. In addition, there was the fact that syphilitic ulceration was more common on the posterior pillars, and it was the posterior pillars which were perforated.

¹ *Lancet*, 1908, i, p. 229.

Case of Fixation of Left Vocal Cord and Tracheal Tugging.

By WILLIAM HILL, M.D.

THE patient was an old man with aneurysm of the aortic arch, and was exhibited to the Section, together with a skiagram showing the condition.

DISCUSSION.

Dr. DAN MCKENZIE asked if Dr. Hill had had experience with the direct examination in cases of aneurysm, and if so whether he regarded the proceeding as a dangerous one. In a foreign journal he had recently seen a statement that, with proper precautions, direct examination in aneurysm was devoid of peril.

Dr. PERMEWAN expressed his pleasure at a case being brought of left cord paralysis, where the aneurysm could be seen. Years ago he raised a storm of discussion in the old Laryngological Society by saying that nearly all the cases of left cord paralysis in which no definite cause could be ascertained were due to aneurysm, even though it could not be felt or seen. He had seen at least three cases in which aneurysm was not physically diagnosed, but the patient died suddenly under conditions suggesting aneurysm. At the meeting he referred to his view had been supported by Professor Chiari: and further experience had only still more convinced him of the truth of it. He was familiar with toxic paralyzes, and those due to central nervous disease; but those classes did not come under his statement.

The PRESIDENT regarded Dr. Permewan's statement as rather sweeping. Statistics collected by Avellis showed that 44 per cent. of cases of left recurrent paralysis were never diagnosed, and they went on for many years. But since X-rays had been used, not so many cases of aneurysm were missed as formerly.

Dr. WATSON-WILLIAMS agreed with Dr. Permewan's remarks. Before the days of X-rays, when left-sided abductor paralysis was found for which no adequate cause could be detected, and the patient was of the age when aneurysm occurred, he frequently ventured to diagnose aneurysm solely from the existence of the paralysis or paresis of the left vocal cord, and that diagnosis had been confirmed by the subsequent increase of the aneurysm and the death of the patient. Even when the physician could not diagnose aneurysm it was safer to suspect it in such cases, and give a guarded prognosis.

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Dr. R. H. WOODS, had always found that where left recurrent paralysis was due to aneurysm there was tracheal tugging. He agreed with Dr. Permewan as to the frequency with which left recurrent paralysis was caused by aneurysm where there was no cause apparent.

Mr. MARK HOVELL said he saw a patient a fortnight ago whose chest had been examined by a physician well accustomed to chest cases, and whose report was that the chest was healthy. But an aneurysm was detected by X-rays.

Dr. FITZGERALD POWELL remarked that in this case tracheal tugging was very marked, and could be seen as well as felt, but he could not agree that tracheal tugging was present in every case of recurrent paralysis depending on aneurysm. As was apparent, this aneurysm was a very large one, but in a number of small aneurysms that he had seen tugging could not be felt. He had observed that pain in one or other shoulder was generally a marked symptom before any other sign could be discovered.

Dr. DUNDAS GRANT said tracheal tugging was a convenient way of checking one's views in cases of recurrent nerve paralysis without intruding too much on the domain of the physician. He agreed with Dr. Powell in doubting whether one could by tracheal tugging detect an aneurysm so small as to escape physical examination. He would like to know if members had seen cases of recurrent paralysis of the left cord get well. He had seen this occur.

Dr. CYRIL HORSFORD said that last July he saw a boy, aged 18, who had complete paralysis of the left vocal cord. His loss of voice had persisted for some months, but on examination by a physician no evidence of either aneurysm or tubercle was found. The history and appearance, however, suggested some disease of the bronchial glands. His occupation being unsuitable for chest conditions, he was advised to leave, and his health then improved a great deal; his voice also improved, for the mobility of the cord was returning.

The PRESIDENT said he showed before the old Society a case in a boy, aged 17, under his care for three or four years at Golden Square Hospital, but nobody could diagnose the cause. He had seen such cases recover, but only after operation when the cause was a goitre. He would still doubt whether the majority of cases of left recurrent nerve paralysis were due to aneurysm; he would not like to say that 50 per cent. were due to aneurysm. If 44 per cent. were undiagnosed, 30 per cent. might be due to aneurysm and 26 per cent. to goitre, malignant disease of the œsophagus and other conditions. Only careful statistics of some hundred or two hundred consecutive cases could settle this point.

Mr. HERBERT TILLEY could remember some cases which would not come into Dr. Permewan's category. One patient, whom he saw four years ago, had had two children in the interval. She had left vocal cord paralysis, which had persisted to his knowledge for four years. No one had been able to find any signs of aneurysm either by X-rays or by ordinary examination of the chest.

Another case was in an adult, aged 52, who had been X-rayed without detecting any lesion. He had also seen one case come on in the course of acute rheumatic fever, with arytaenoid swelling and joint pains. The rheumatism cleared up but the movement of the cord was not restored. He agreed with Dr. Permewan it was a good principle to regard a left cord paralysis as serious, yet one should not be too ready to come to the conclusion that aneurysm was the cause.

Dr. FITZGERALD POWELL reminded the members that he had shown at a former meeting of the Society a case of complete recurrent paralysis in which no cause could be found to account for its presence; it was in a young man, and "aneurysm" was excluded by all the methods of examination. The paralysis existed for some months, was under treatment without effect, but got well of itself after treatment had been stopped. In twelve months' time after straining the voice it suddenly returned, and the patient came under his care. When the case was shown to the Society it was thought to be due to influenza, and Sir Felix Semon mentioned that several cases had been reported in Germany as being caused by the toxin of influenza. Possibly some of the cases mentioned by Mr. Tilley were due to this cause. However, he agreed with Dr. Permewan that in undiagnosed cases of recurrent paralysis the majority were due to aneurysmal pressure.

Dr. HILL, in reply, said that, in showing the case, he had in view Dr. Permewan's pronouncement made before the Laryngological Society many years ago. Since then he had seen many cases of left recurrent paralysis with fixed cord, but very few cases were associated with aneurysm. He thought the President had more correctly summarized the significance of left cord paralysis. When it was not due to obvious lesions in the neck or gullet there was a presumption of aneurysm. This case further showed the value of an X-ray examination when the ordinary clinical examination of the chest was indecisive. In answer to Dr. McKenzie, he would not advocate the passage of an œsophagoscope in a case of known aneurysm, though he had, by means of the instrument, on one occasion found an unsuspected aneurysmal dilatation of the lower thoracic aorta, where he had expected to find an endo-œsophageal stricture.

Foreign Bodies removed with the aid of Upper Bronchoscopy in an Infant 13 months old.

By WILLIAM HILL, M.D.

THE child was sent to hospital with a history of an attack of dyspnoea six days previously when eating a piece of chestnut, and there had been cough and bad entry into the left lung ever since, with bronchorrhœa and fever. A small bronchoscopic tube was passed, under chloroform,

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by the oral route, and a small white body was seen projecting from the first hyperarterial secondary bronchus into the main left bronchus. On account of the small calibre of the tube difficulties were experienced in manipulating forceps and a small enough hook was not at hand. A Brünings's suction tube was then passed down to the foreign body and the tube was connected with a Senorans exhausting bottle; on suction being made and the tube withdrawn the larger of the two pieces of chestnut shown was found adhering to the end of the tube; a second portion was seen in the endoscope, but before it could be seized it was drawn into the right bronchus; following it up with the endoscope, cough was induced, and the piece of chestnut was ejected. An intubation tube had to be inserted twelve hours later on account of subglottic œdema, and could not be dispensed with altogether until the tenth day. The child left hospital at the end of a fortnight quite well.

This is probably the youngest recorded case of removal of a foreign body *per vias naturales* by bronchoscopic aids. Killian¹ has recently published records of nineteen collected cases of foreign bodies removed by upper bronchoscopy, whose ages varied from 14 months to 7 years, and subsequent tracheotomy was performed in twelve cases, and intubation in the remaining seven cases. The inference is that in young children it is always wise to insert an intubation apparatus immediately on withdrawal of the endoscope when upper bronchoscopy is resorted to. Tracheotomic bronchoscopy brings one nearer one's work, but is less artistic, as involving a cutting operation which obscures the field of investigation by hæmorrhage.

DISCUSSION.

Dr. BROWN KELLY congratulated Dr. Hill on the result, which seemed to establish a record for age. Anyone who had used Brünings's smallest tubes in infants could picture to himself the difficulties surmounted. He was surprised that in all the cases collected by Killian, as well as in Dr. Hill's patient, either intubation or tracheotomy had been required afterwards. He had removed a foreign body by bronchoscopy in a boy, aged 3, and in another, aged 7, but in neither of these cases did dyspnœa supervene. For diagnostic purposes he had used the tubes in several infants about 6 months old, and in only one case—and in that the cause was doubtful—was there difficulty afterwards.

¹ *Deutsch. med. Wochenschr.*, Leipz., 1911, xxxvii, p. 1204.

Mr. HOWARTH said that in spite of the brilliantly successful result obtained he was by no means convinced that upper bronchoscopy was the best method to employ in such cases. There were several dangers. The first was that the pressure of the tube on the delicate larynx of a child might, and often did, cause subglottic swelling; the urgent symptoms of this might be relieved by an intubation tube, but this acted as an irritant body and increased the danger of subglottic stenosis. He recalled a case of extraction in a child aged $1\frac{1}{2}$ years in which an intubation tube was inserted on the following day to relieve subglottic swelling, with the result that a very intractable subglottic stenosis was formed. The second danger was that during extraction a piece of the foreign body, if it was a friable one, might break off and might be aspirated into the bronchus on the healthy side. It would be necessary to introduce the tube rapidly, and this could best be done if the lower method had originally been employed. Moreover, it was possible to pass a larger tube through the tracheotomy wound, as the larynx of a child of this age would not take more than a 7-mm. tube with safety. He could not agree with Dr. Hill's suggestion that intubation should be employed as a routine measure after the use of the upper method.

Mr. MARK HOVELL said the case was different in adults. Some time ago he was called to see a professional singer, a lady, who whilst eating a walnut laughed and drew a segment into the trachea. He could see it move at the upper part of the right bronchus, and was urged to open the trachea and remove it. But he declined to operate, and watched the case, as there was enough airway by the side of the piece of walnut, and the lung did not suffer. After two or three days the piece of walnut softened and was coughed up. The only treatment employed was keeping the patient in the horizontal position.

Dr. HILL, in reply, said he did not suggest that in every case intubation was necessary after bronchoscopy, though it was doubtless a wise precaution to avoid being called up in the middle of the night. If the intubation tube were of the right size he did not think it would do the child much harm if worn for a few days. He used a bronchoscopic tube, 9 mm. in diameter, in this case, and another occasion he would perhaps use a smaller tube in so young a child. He considered Killian's bronchoscopic tubes were better than Brünings's, because space was lost by the extension tube and made instrumentation more difficult. For children especially he had reverted to the old Killian tube. He admitted there was much to be said for doing the lower operation, in view of the fact that Killian had collected records of so many cases in infants where tracheotomy or intubation had been subsequently called for, although it did not seem so artistic a method. He had shown the case mainly to illustrate the result of suction where, as in an infant, the manipulations of forceps and hooks were difficult on account of the necessarily small calibre of the bronchoscope employed.

Two Cases of Carcinoma of the Deep Pharynx.

By WILLIAM HILL, M.D.

Case I.—Carcinoma involving the posterior wall and left pyriform fossa of the deep (post-cricoidal) pharynx in a woman, aged 41. ? Operable.

Case II.—Carcinoma involving the whole depth and circumference of the deep pharynx, including the pharyngeal aspect of the arytaenoids, in a man, aged 56; the glands in the neck are extensively involved. The case is obviously inoperable, and is shown previous to being referred to the Radium Institute for palliative treatment.

Mr. ROBINSON was positively of the opinion that nothing at all should be done in Case I. There were glands on both sides, attached to the posterior margins of the thyroid body, and to get the growth away one would have to remove the thyroid as well as the other structures.

Tuberculous Disease of Larynx in a Man, aged 37.

By W. H. KELSON, M.D.

THIS patient was shown in March, 1910, when he had in addition signs of phthisis at both apices. He went to a sanatorium, and the physical signs of phthisis have now disappeared from his lungs; he has increased considerably in weight, and his temperature keeps down. His epiglottis, however, is about the same, and there is also a small ulcer at the base of the right arytaenoid. He has had no treatment for his larynx since entering the sanatorium.

The case is shown to illustrate the fact that in tuberculous disease the larynx does not always heal *pari passu* with the lung.

DISCUSSION.

Dr. JOBSON HORNE asked whether Dr. Kelson was satisfied that the laryngeal lesion was entirely due to tubercle. The fact of the man having phthisis would naturally suggest it might be tuberculous, but such a clinical appearance might be partly due to syphilis. If a portion of the epiglottis had not already been removed for microscopical examination, he suggested that that might be done.

Mr. HORSFORD asked why the larynx had not been treated surgically, so as to remove the focus of disease.

The PRESIDENT said it was recognized that there was no necessary parallelism between the disease of the larynx and that of the lung. Many lungs improved while the larynx went to the bad. But there were larynges which could be healed while the patient was dying. It was against treating those cases that he had sometimes protested. When a patient would die in a year or two, unless there was dysphagia or stridor, he would only treat the larynx symptomatically. This present case had lasted since March 1910, and the larynx was not worse, so it illustrated the value of sanatorium treatment. In the old days tuberculous infiltration of the epiglottis would not have gone on for eighteen months and left the larynx as quiescent as this one was. It was an indolent form of tubercle, and might well be called lupoid.

Dr. KELSON, in reply, said he showed the case because some people had the idea that if a patient were sent to a sanatorium that was all which was needed. At the sanatorium he was treated for the lung condition, which got well, but the larynx was not treated, and did not get well and a fresh ulcer had appeared at the base of the aryæmoid. The patient said he now felt much better, and his lungs were now reported to be sound. He proposed to treat the larynx.

Case of Abductor Paresis with Tuberculous Disease of both Apices.

By W. H. KELSON, M.D.

PATIENT, a man, aged 44, is suffering from chronic phthisis and gets attacks of inspiratory dyspnœa, outward movement of the cords being markedly feeble.

DISCUSSION.

Dr. DUNDAS GRANT remarked that the stridor was markedly expiratory, which, with pure abductor paralysis or paresis, was, to say the least, unusual. It pointed to something subglottic or tracheal, but in this case he thought it was a pure neurosis, and that it would probably disappear under an anæsthetic.

Mr. TILLEY said he could not satisfy himself as to the presence of abductor paresis; he held the patient's tongue gently, but the cords seemed to be abducting in the normal fashion.

Dr. PERMEWAN said that Sir Felix Semon was probably the only man who could definitely say whether there was abductor paresis or not in such a case. For his own part he agreed with Mr. Tilley and was unable to satisfy himself that there was any.

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Dr. W. HILL said that Sir Felix Semon had stated that these cases often varied as regards the amount of movement from day to day. He (the speaker) showed two cases at the last meeting which had, when examined at the hospital, anaesthesia with marked paresis, but there was at the meeting very little. In those two cases he had argued that variability supported the idea of the presence of functional trouble.

Dr. WATSON-WILLIAMS said his impression was that the left vocal cord in this patient was markedly paretic. In order to get over the question of a mere temporary absence of abduction which a nervous patient sometimes showed, he asked the patient to sing a prolonged note and then take a deep breath. This left him in no doubt that there was abductor paresis, particularly on the left side.

Dr. DAN MCKENZIE believed there was abductor paresis in both cords. When he examined the case he saw the cords swing out to their full extent at the beginning of inspiration, but after a short period they approximated and remained close together. This might either be due to paresis of the abductors or to spasm of the adductors.

The PRESIDENT said he used to think he had cases of abductor paresis, and exhibited one or two, but as he learnt by experience he ceased to find such cases. He believed it was rather adductor spasm in this case. Double abductor paralysis was one of the rarest things which occurred in neurosis of the larynx, whereas adductor spasm was very common. In 150 cases of laryngeal paralysis, Avellis had found it to be bilateral in only twelve. He had a private case in which it was impossible to settle the question without chloroform. That patient was a morphomaniac. People who had been to a sanatorium, and got their tubercle arrested, became introspective, and were apt to suffer from functional aphonia and adductor spasm.

Dr. KELSON, in reply, said he had never seen the patient abduct his cords properly. They moved, but the glottis was never widely open. The case was sent to him by a physician who was treating the patient for his lungs, and as the patient made a noise in breathing he wanted to know if there was anything in the larynx which accounted for it. The case varied a good deal, and he wondered whether it was one of the rare cases recorded by Schrötter and others in which the recurrent laryngeal was caught by the thickened pleura. The phthisis was very chronic and apical.

Prolonged Laryngeal Stenosis from some obscure Inflammatory cause (? Pneumococcus Infection).

By DAN MCKENZIE, M.D.

A WOMAN, aged 57; first seen January, 1911, on account of dysphagia, and some dyspnoea of gradual onset and of two or three months' duration. Examination showed a tumour on the left side of the pharynx with its main mass below the level of the tongue, and preventing a view of the larynx. The glands at angle of jaw were enlarged and hard, and some œdema of the faucial pillars on the left side and of the neck around the glands was noted. Provisional diagnosis of sarcoma. Two days later admitted to hospital for observation. Sudden onset of urgent dyspnoea necessitated hasty tracheotomy under local anæsthesia, an operation difficult on account of œdema which had spread all round the neck.

The patient being unable to swallow, a small œsophageal tube was inserted. Acute pneumococcal bronchitis followed the operation and lasted a week, during which the œdema and swelling of the neck and pharynx subsided, and a view of the larynx was obtained. There was general œdematous laryngitis, and the left cord was fixed. Three weeks later the laryngeal tumefaction also disappeared, although the cord remained immobile, and the tracheotomy tube was removed. A fortnight later, however, subglottic swelling made its appearance, and the tube had to be reinserted. The laryngeal stenosis now became absolute, and continued so for several weeks. On the advice of Dr. Dundas Grant, a low tracheotomy was performed. A week or two later the patient nearly lost her life from asphyxia by the tracheotomy fistula closing when the house surgeon was changing the tube. Breathing was re-established, but the patient remained unconscious and cyanosed until I performed phlebotomy and drew off about a pint of blood.

During the last three months the larynx has gradually improved. Two granulomatous masses, one in the anterior commissure, and the other also in front but below the cords, have been removed by the direct method. The cords move equally, and the patient can breathe *per vias naturales*, and is able to phonate. The tracheotomy tube is still in situ, and will be left until we can be sure that the granulomata will not recur.

The origin of the inflammation is obscure, but Dr. Logan Turner, who saw the case, suggested pneumococcal infection as the cause, a supposition strengthened by the pneumococcal bronchitis that followed the first tracheotomy. The early disappearance and non-recurrence of the pharyngeal swelling are worthy of remark.

DISCUSSION.

Dr. BROWN KELLY said the sequence of events noted in the early part of the report—tumour in the pharynx, enlarged glands at angle of jaw, diagnosis of sarcoma, subsequent clearing up of whole condition—reminded him of a case he saw some time ago of an old lady who was considered to have malignant disease of the tonsil. On examination he found a growth the size of a hen's egg with an ulcerated surface, and from the appearances, &c., he had no hesitation in corroborating the diagnosis that had been made. Having told the relatives of the hopeless outlook, he was surprised to learn later that immediately after his visit the growth had begun to slough, and in three weeks it had quite disappeared and the parts had healed. Somewhat similar cases had been reported by Sir Felix Semon, Broeckaert, and others; and recently Gleitsmann had written on the subject. There were also cases on record in which supposed malignant diseases had cleared up after the administration of arsenic. All these cases, as well as Dr. McKenzie's, might belong to the same category.

Dr. PERMEWAN said that three weeks ago a surgical colleague asked him to see a case which had been admitted for cancer at the back of the tongue, with a large mass of glands. The surgeon opened the glands, and felt no doubt about the diagnosis. But as there was a point of suppuration in the glands, he asked him (Dr. Permewan) to see the case. Three weeks afterwards nothing could be seen of the swelling, so that clearly it was not a case of malignant disease.

Dr. MCKENZIE, in reply, said he regarded the events in the case as still in progress. If anything happened in the next three months he would report it. It was a change in the larynx he had noticed that day which induced him to sound this note of warning. It was still possible that there was a slow malignant process going on.

Laryngeal Case for Diagnosis.

By DAN MCKENZIE, M.D.

THE patient is a man, aged 43. First seen on April 24, 1911, complaining of slight huskiness of voice. The cords showed some redness on both vocal processes, but the redness was most marked on the left, and here a whitish warty-like growth appeared six months later, with some infiltration round it. This growth was removed on September 30 by the direct method, and Dr. Wyatt Wingrave reported it to be "a simple squamous papilloma," with a "very scanty connective tissue core," and no evidence of malignancy. Since the removal of the growth the cord remains as before. The vocal process is still red and infiltrated, and the ulcer left by the operation has not healed. The diagnosis of malignancy seems to be excluded by the pathological examination. There is no sign of tuberculosis, if we except an occasional rhonchus at the left pulmonary apex behind. The sputum has been examined by Dr. Wingrave, who reports that there are no tubercle bacilli present. If the lesion is purely inflammatory, suggestions as to treatment would be welcomed.

DISCUSSION.

Mr. HERBERT TILLEY thought that the amount of congestion was what one saw after removal of a benign laryngeal growth. It might remain in the cord a long time after the operation. He would treat it with strong nitrate of silver.

Mr. HORSFORD remembered treating a case of unilateral laryngitis, which cleared up eventually under tertiary syphilitic treatment. He would carry out the same treatment here.

Dr. FITZGERALD POWELL agreed with Mr. Tilley that it was probably a chronic inflammatory condition, the result of traumatism, and that nitrate of silver, or chloride of zinc in solution, would probably clear it up.

Dr. BROWN KELLY regarded it as a case of pachydermia. The pathologist's report—"a simple squamous papilloma"—supported this view. Chiari had proposed that the term "papilloma laryngis" should be applied to the condition described as pachydermia verrucosa. Treatment was not of much use in pachydermia.

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THE PRESIDENT agreed with Dr. Brown Kelly. There was some infiltration in the opposite vocal process. The redness about the whitish warty growth did not necessarily suggest malignancy. He had followed up a number of cases of pachydermia, and had seen the condition subside and return. One case, suggestive of malignant disease, had even the movement of the vocal cord slightly impaired. This patient passed for a while into other hands, and a tracheotomy was done preliminary to excising the larynx; fortunately this was not carried out. That was four years ago, and the patient was now well in regard to the larynx, but still had the pachydermia. Recently he asked Sir Felix Semon to see a case the description of which answered exactly to this one; it was left alone and cleared up. The less done to such cases the better; he would not even paint with nitrate of silver, but would stop tobacco and procure as much rest to the voice as possible.

Dr. MCKENZIE, in reply, said he was relieved to hear that the members regarded the case as simple.

Forceps for the Direct Removal of Laryngeal Growths.

By DAN MCKENZIE, M.D.

THE forceps are a modification of other well-known types. The modification consists in a double joint at the elbow, which permits of the beaks being opened and closed while the instrument remains stationary. In the other forms this opening and closure is accompanied by a considerable excursion of the distal end of the instrument, a movement which necessarily adds to the difficulties of manipulation.

Large Suppurating Bony-walled Cyst of Right Middle Turbinal, associated with Chronic Empyema of corresponding Antrum.

By HERBERT TILLEY, F.R.C.S.

MISS C., aged 63, had complained "for years" of increasing difficulty of breathing through the right nostril, from which there was frequently a discharge of mucus, "sometimes tinged with matter."

Examination, November 11, 1911: The right nasal cavity was quite obstructed by a firm, pale swelling, which could be only slightly indented with a probe. The right antrum was dark on transillumination.

Operation, November 12: The canine fossa and ascending process of superior maxilla were exposed; the former was opened and the latter removed, as in Denker's operation. The inner antral wall was pushed outwards to such an extent that the sinus was reduced to a crescent-shaped cavity. It was full of pus. When the thinned inner antral wall was removed the cyst was fully exposed and removed. Recovery rapid and uneventful.

The exhibitor is indebted to Dr. Barclay Baron, of Clifton, for the opportunity of seeing and operating on the case.

DISCUSSION.

Dr. WOODS said that some years ago he had a similar case. Cysts of the middle turbinal of small size were common enough, but in the case he referred to both sides were affected, and the bones were ballooned so as to grow out through the nostrils, completely stopping the nose. After being snared it had to be broken up so as to get it out of the nostril.

Dr. W. HILL did not think the term "cyst" was appropriate. They were air-cells of the middle turbinal, which became blocked and then suppurated. He would call it a retention sinusitis.

Mr. HERBERT TILLEY replied that there were no symptoms except the complete nasal obstruction, which was remarkable seeing the amount of pus which was in the antrum. He agreed that it was not a cyst in the strict pathological sense. The suppuration in the cell was probably an accident; it was the largest specimen of the kind he had seen.

Patient cured of External Suppurating Frontal Sinus Fistula by Intranasal Operation.

By HERBERT TILLEY, F.R.C.S.

Mr. T., aged 71, consulted me in February, 1910, for a discharge beneath the inner end of the left eyebrow which had been present for twelve months.

Examination (February 3, 1911) showed a suppurating fistula opening about $\frac{1}{4}$ in. above the internal canthus, through which a probe could be passed inwards and upwards towards the floor of the left frontal sinus. This probe could be touched by another passed into

the frontal sinus by way of the nose. The left antrum was dark on transillumination, and exploration proved it to be full of fetid pus.

On February 2 the radical canine fossa operation was performed on the left antrum, and it was intended to open the frontal sinus at the same time, but the patient was so unwell under the anæsthetic that I thought it wiser only to remove the middle turbinal and those anterior ethmoidal cells in the immediate neighbourhood of the fronto-nasal canal. It was then quite easy to pass a probe into the frontal sinus, and during subsequent days this cavity was daily irrigated with warm, weak antiseptic lotions. The fistula gradually healed, is now firmly closed, and there has been no discharge from it for at least six months, and the other sinuses are quite free from inflammation.

It is sometimes stated that an external fistula is one of the indications for a radical external operation, but the above case shows that such a rule may have exceptions.

The PRESIDENT said he had had some cases which opened spontaneously, and some which had been opened by ophthalmic surgeons in the inner canthus. They looked as if they might come from the frontal sinus, but in one or two instances they originated in a fronto-ethmoidal cell. Several cases occurred after influenza four or five years ago. Those fistulæ would cease when the inside of the nose was attended to.

A Case of Unilateral Paralysis affecting the Face, Pharynx, Larynx, and Tongue, acute in Onset.

By GEORGE WILKINSON, F.R.C.S.

THE patient, a married woman, aged about 32, came to see the exhibitor from Melton Mowbray on August 8 last. This is the only occasion on which he has seen her.

Her medical man, Dr. Nutman, of Melton Mowbray, has kindly furnished the following particulars: I first saw her for an attack, febrile in character, attended by vomiting, in September, 1910. The highest temperature was 102° F. I thought it was due either to influenza or "spotted fever," which at that time was very prevalent here. (Dr. Nutman informs me that there were also several cases, about 18 or 19, of infantile paralysis in the neighbourhood at the time.) The vomiting stopped after about twenty-four hours, but the fever

remained for four or five days. After the first day some paralysis of the right side of the face was noticed. After about ten days my attention was called to paralysis of the palate by regurgitation of fluid through the nose on swallowing. There was never at any time any paralysis of the limbs or inco-ordination. I have nearly lost her on several occasions from attacks of bronchitis. She had never had bronchitis before. The seriousness of the bronchitis was much increased owing to the ineffectual character of the cough, and by the tendency to severe spasm of the larynx. Belladonna gave great relief. No Klebs-Löffler bacilli were present.

In December, 1910, she saw a physician at Leicester, who diagnosed the case as one of acute polio-encephalitis (a diagnosis in which reporter concurs).

Condition on August 8, 1911: The patient complains of fluids regurgitating through the nose, and of difficulty in avoiding "choking" during swallowing. The articulation is not markedly affected, though the gutturals are imperfectly pronounced owing to imperfect closure of the nasopharynx. The voice is strong and natural. It has never been lost. The paralysis of the face has almost disappeared. There is slight contracture of the muscles at the right angle of the mouth. Paralysis of the muscles of the soft palate is almost complete, and limited to the right side, and there is a considerable degree of anæsthesia in these regions. No definite wasting of the muscles. The right half of the tongue is slightly wasted. It appears slightly broader than the left half, but not so thick. The tongue is protruded towards the right. On examination by the laryngoscope there was seen to be incomplete abductor paralysis of the right cord. No examination of the sensibility of the larynx was made, on account of the patient's dread of "spasms of the throat" being induced.

There is now no anæsthesia of the face, or paralysis of the pterygoids, such as was observed by the physician whom she saw in December. No oculomotor or orbicularis paralysis. The hearing is good. The sterno-mastoids and trapezii muscles are normal. There is no motor or sensory paralysis, and no disturbance of the reflexes in the limbs. The patient has great difficulty in taking sufficient food to maintain proper nutrition, owing to the regurgitation and the frequent attacks of choking. She has one meal each day through the stomach-tube.

DISCUSSION.

Dr. WATSON-WILLIAMS asked if the paresis was previously much more marked. He gathered that the patient was now much better than she had been.

Dr. FITZGERALD POWELL thought this a very interesting case, but did not think that it quite bore out the characters of anterior poliomyelitis. There was no paralysis of the muscles of the limbs. The patient was an adult female. It usually occurred in young children or adult males. Moreover, it must be very rare for the group of nerves affected in this case to be involved in anterior poliomyelitis. He would be inclined to attribute the present condition more to some central lesion or inflammation in the medulla or floor of the fourth ventricle.

Dr. DAN MCKENZIE thought that probably it was the cells in the basal ganglia of the brain which had been affected. The question was neurological rather than laryngological, but the subjects of poliomyelitis and polio-encephalitis were interesting. He understood that the disease in so far as it fell upon the brain might attack the motor cells either of the cortical areas or of the basal ganglia. The existence of unilateral laryngeal paralysis in this case pointed to the ganglia as the seat of the disease, since a unilateral lesion of the motor areas would not induce laryngeal paralysis.

Mr. WILKINSON replied that though it was a neurological case it was not without interest for the Section. He thought that the variety of names under which the condition was described in medical literature had led to some confusion (e.g., acute polio-encephalitis, acute polio-encephalitis inferior, acute bulbar paralysis, bulbar complications of acute anterior poliomyelitis). In some of the text-books acute bulbar paralysis was described as a separate disease, invariably fatal. He quoted Starr's description,¹ which put the facts in a clear light: "There is a form (of encephalitis) limited to the nuclei of the motor cranial nerves of the tongue and face, termed polio-encephalitis inferior or acute bulbar paralysis, and causing all the symptoms of chronic bulbar paralysis, but with acute onset and rapid course." The lesions were those of acute poliomyelitis but situated in the bulb. The most unusual feature of the present case was the sharp limitation of the lesions to one side, and to a group of muscles the nuclei of which were all close together, without any involvement of the trunk or limbs.

¹ Starr, "Diseases of the Nervous System," 3rd edit., 1910, i, p. 532.

Notes of Three Cases illustrating Infection of the Accessory Sinuses, by Entry of Water into the Nose during Bathing ; and of a Fourth Case having possibly the same origin.

By GEORGE WILKINSON, F.R.C.S.

Case I: Frontal sinus suppuration.—A man, aged 19, who was operated on successfully for right frontal sinus suppuration, in November, 1905, attributed his nasal trouble to a "cold after bathing." On further inquiry the following account was elicited: When at school he was in the habit of bathing with other boys in a canal. On one occasion, two years previously, he got "a noseful of water" after diving in. Next day he had rather a severe headache, and a severe chill in the head. Profuse purulent discharge followed. Since that time he had suffered from a stuffiness of the right nostril, offensive discharge, frontal headache, dizziness on stooping, and sleepiness.

Case II: Left antral suppuration.—A married lady, aged about 32; first seen on May 2, 1910. She was found to have a foetid empyema of the left antrum. This was cured by a Caldwell-Luc operation. She likewise referred the starting point of the nasal trouble to a "cold caught at the swimming baths" six months previously. Being asked for details, she said that on the last occasion when she visited the baths she had a fainting attack, and sank to the bottom. She was quickly hauled out. The next day she had violent neuralgia in the face and frontal headache, and was confined to bed for several days. On subsidence of the pain she was left with a severe "cold in the head," with purulent, offensive discharge from the nose, which mostly found its way into the back of the throat. The discharge had continued ever since, and she had suffered from severe frontal headaches.

Case III: Ethmoiditis with polypi; secondary infection after bathing; acute septic ethmoiditis and frontal sinusitis; osteomyelitis of the frontal bones; subdural abscesses, and ? abscess in the left frontal lobe; death.—A youth, aged 17, was seen at the Sheffield Royal Hospital on August 16, 1910. Pus, polypi and swelling of the middle turbinal were found in the right nostril. He was entered for admission to the hospital for curetting of the ethmoid. As it was not regarded as urgent, admission

was deferred for a fortnight, to allow of his taking a holiday at the sea-side. When sent for at the end of that time he did not appear. He was sent on October 2 by his medical attendant as suffering from "orbital abscess." He gave the history that on the day of his return home from his holiday he began to be ill, with intense headache, and "cold in the head." On the day previous he had bathed in the sea. He rapidly became worse, with severe pain and tenderness over the forehead, and fever. The right eye and forehead swelled. A diagnosis of acute septic frontal sinusitis and osteomyelitis of the frontal bone was made. Both frontal sinuses were opened and were found to contain a quantity of pus. At a subsequent operation large subdural abscesses on both sides were opened. Eventually he died on November 9, with symptoms of left-sided frontal lobe abscess.

Case IV: Acute frontal sinus suppuration and osteomyelitis of the frontal bones; death from pyæmia of the lungs.—On May 24, 1911, I saw a boy, aged 15, supposed to be suffering from orbital abscess. His right eye was completely closed by swelling of the lids, which extended over the forehead up to the vertex, and across the root of the nose to the opposite eyelids. Temperature 104° F.; pulse 120. He was delirious: no coherent answers could be got from him, except that he had bad headache, and pain in the chest. The right middle turbinal was swollen and there was pus in the right nostril. Respirations 40. The parents informed me that the pain began in the forehead on May 18. They knew of no cause for the illness. There had been no injury and no previous complaint of any nasal trouble. I elicited, on inquiry, that he had been to the swimming baths on the evening of May 17. A rapid operation was done on the frontal sinuses, the anterior walls being freely removed. They were full of pus. Free drainage was provided. No relief resulted from the operation, the patient rapidly becoming deeply comatose, and dying next day.

DISCUSSION.

Dr. WATSON-WILLIAMS said that at one time he had charge of a public school, and noticed that especially during the summer months there was a tendency to acute otitis media, which was due to infection from the school baths. The ear was more susceptible to infection from bathing than the nose.

Dr. DAN MCKENZIE said that Dr. Wyatt Wingrave took great interest in the question of the infection of the ear by sea-bathing; one summer he took

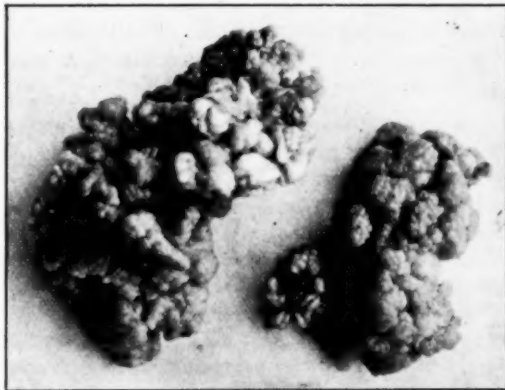
samples of sea-water from several health resorts on the English sea-coast, and found the *Bacillus coli communis* in every one.

Mr. WILKINSON, in reply, said the school authorities in his district compelled the children to go to swimming baths, and he had pointed out to them the danger of sending children there who had discharges from the ears. It was a point of some practical importance as to whether children with nasal discharges should not also be prohibited from bathing.

Papilloma growing from the Inferior Turbinate.

By E. W. BAIN, F.R.C.S.

Mrs. L., aged 56, first seen in January, 1911, complaining of left-sided nasal obstruction and epistaxis. On examination, the left side of the nose was found to be occupied by a soft, papillomatous growth,



Photograph of large portion of papilloma growing from inferior turbinate.
(Natural size.)

attached by a broad base to the inferior turbinate. The growth was removed, but recurred in three months. It was again removed, and when the patient was seen recently, had once more returned. A section of the growth was taken for microscopical examination, and the pathologist reported it to be a proliferating papilloma. A microscopical section of the tumour and a large portion of the growth were exhibited. Opinions were invited as to treatment.

DISCUSSION.

The PRESIDENT said there were in literature only fourteen authenticated cases of papilloma of the nose. He recalled the case shown by Dr. Logan Turner, and described in the *Archives of Otolaryngology*.¹ These tumours grew from the septum or from the inferior turbinal and were apt to simulate a sarcoma.

Dr. W. HILL said he had one such case in private, and about the same time he had one under him at St. Mary's Hospital, which bled a great deal. It was a true wart, and after its removal the base still bled. It came from the favourite spot for septal hæmorrhage. He did not think such cases were as uncommon as had been suggested by the President's statistics. When small they would probably be regarded as too trivial to be worth recording. Those of large size, such as Mr. Bain's specimen, were probably infrequent.

Mr. BETHAM ROBINSON corroborated Dr. Hill's remarks. Many years ago he first removed a small one from the tip of the inferior turbinate, and did not think it worth while to record it. The reason more were not published was probably that only the large ones had been thought worthy of record.

Dr. WOODS said he had seen the condition. The favourite site was towards the front of the nose, on the septum. Sometimes it was pedunculated, sometimes more sessile.

Dr. PEGLER said it was remarkable that of the fourteen recorded cases of squamous papilloma of the nasal cavities alluded to by the President, six were represented by microscopical sections in the collection of the Society. The exhibitors included the late Mr. Cresswell Baber, Mr. de Santi, Mr. Macleod Yearsley, Dr. Logan Turner, and Mr. Wyatt Wingrave, whose case was a vestibular growth. Speaking from memory, he would say the present one resembled Dr. Logan Turner's, which was a large cauliflower-like papilloma. These growths were rare, but they were closely simulated by another class of neoplasm equally innocent clinically, but mainly distinguished by the character of the epithelium, which was of the palisade form and ciliated. In a recent case of this nature upon which the speaker had operated, these growths were studded over and firmly fixed to the floor of the inferior meatus, and some were also attached to the neighbouring parts of the inferior turbinal and septum. They could scarcely be described as ordinary papilliform mucous hypertrophies. At a future date he hoped to show the patient and sections.

Dr. JOBSON HORNE did not think such cases of innocent bleeding intra-nasal tumours were as rare as was thought. To save useless discussion they should be put under a general class of "bleeding polypus," using the term in a comprehensive and non-committal sense. About twenty years ago he showed a case with a similar growth in the same position.

¹ *Arch. of Otol.*, New York, 1897, xxvi, pp. 141-146.

Mr. WILKINSON had a specimen very much like it. It was a pedunculated tumour the size of a large chestnut, growing from the back of the inferior turbinal into the nasopharynx and blocking up the nose. In this case the opposite inferior turbinal was covered with ordinary papilliform hypertrophy.

Mr. HERBERT TILLEY thought the best treatment would be to remove the anterior half of the turbinal from which the tumour grew. If that did not effect a cure, one could perform a more extensive operation. Most members must have seen somewhat similar cases and he had a picture of a small papilloma of the inferior turbinal amongst his collection.

Mr. BAIN replied that he understood the condition was very rare, and he therefore made the diagnosis with some hesitation. There were certain features in the microscopical section of the growths which were suggestive of malignancy, and he thought it advisable that the Morbid Growths Committee should make a report on it.

Pharyngeal Tuberculosis; Tuberculous Lesions of other Parts; Treatment by Injections of Tuberculin.

By T. JEFFERSON FAULDER, F.R.C.S., & W. D. HARMER, F.R.C.S.

G. M. T., FEMALE, aged 24.

History: Tuberculous dactylitis from childhood; finger amputated. Eleven years ago disease of right elbow, now quiescent. About seven years ago disease of right breast, possibly still active. About eight years ago began to suffer from sore throat and repeated "abscesses" in the throat; was an inmate of a chest hospital for seventeen weeks, at that time without any improvement. The disease of the throat began in the tonsils and spread to adjacent parts of the pharynx. It consisted of callous ulceration, granulomatous formations, and thick membranes. It appears to have been arrested during the administration of tuberculin.

Treatment by injections of tuberculin began on February 9, 1911, with a dose of T.R. $\frac{1}{10000}$ mg. This has been increased gradually and continued weekly up to the present time, the last dose being $\frac{1}{500}$ mg.

The tuberculous sinus present in the right breast healed after four injections. There have been no ill-effects from the injections except malaise on one occasion, when a dose of T.R. $\frac{1}{1000}$ mg. was given. As a rule, the patient states that after the injections she feels very much better than usual. There is marked improvement in the throat.

DISCUSSION.

Dr. WOODS said he had never seen quite this clinical picture; it did not look like lupus of the pharynx. It presented an appearance akin to leucoplakia. He asked why it was regarded as lupus.

Dr. JOHNSON HORNE said if it were a tuberculous lesion in the pharynx it was remarkable that the larynx had escaped invasion. In the cases of tuberculosis of the pharynx which he had seen, the larynx had always been involved, and the lungs also. He would be glad to hear the experience of others as to the relative frequency of the escape of the larynx when tubercle was found in the pharynx.

Dr. H. J. DAVIS said that last year he had a private case—a man, aged 39, who died of tuberculous pharyngitis. The entire soft palate was destroyed, but there were no signs in the larynx at all. Dr. Jobson Horne, and he believed the President also, had seen the case.

The PRESIDENT said a case such as this was unusual in his experience. When acute miliary tuberculosis attacked the pharynx it did not last long. It was very rare except in advanced cases of tuberculosis. In the present case there was a white milky patch without very marked infiltration of the tissues, and the uvula was thin and drew up instead of being leathery. The patient had nothing in her nose. He agreed that it was rare to find lupus in the pharynx without it attacking the larynx. In many cases when one put in adrenalin and cocaine one could see the scars of old lupus. It was uncommon to have lupus of the pharynx without it being in the nose also. He presumed the woman had reactions after the injections. She evidently had tubercle elsewhere. He did not know what the condition was in this case, but it might be self-induced. He suggested a section should be made from it.

Dr. FITZGERALD POWELL said he thought the case was one of chronic tuberculosis of the pharynx. He had had cases, and the one he had specially in his mind was that of a young woman who consulted him for ulceration of the edge of the soft palate and uvula; she also had some pulmonary tubercle. On curetting repeatedly and the use of lactic acid and iodoform, the ulceration completely cleared up and got well; it was a chronic tuberculous ulceration without any of the characters of lupus. He could not admit that these cases ended fatally on all occasions. He was now treating a case of acute miliary tuberculosis of pharynx and larynx, but these cases went downhill very fast.

Mr. FAULDER, in reply, said the patient had been under observation from nine to ten years, and had had a great deal of treatment. She had had repeated abscesses in different parts of the throat, and a spreading ulceration. The report always was that it was tuberculous. Painting with lactic acid

and other local treatment had been tried, and there had always been the formation of a membrane. He had not seen a similar case before, but had seen tuberculous ulceration of the tongue which did not spread to other parts. The patient was in a chest hospital for seventeen weeks, probably because she had lung symptoms, but they had cleared up. She was shown to demonstrate the possibility of safely treating out-patients with tuberculin injections, as well as the improvement under such treatment. With regard to the suggestion that it might be artefact, she also had tuberculous dactylitis and tuberculous disease of the elbow, and now had tubercle of the breast. He believed that as the disease began in the tonsils, if these had been removed earlier she might have been saved some of her subsequent trouble. There was reaction only after the larger injections.

Mr. HARMER, in reply, said that four years ago the ulceration was deeper and the disease more active. Following the injections the disease was more superficial, and one could often peel off from the surface a membranous deposit. During the last four years he had seen three other cases like this in appearance. The first was in a boy, aged 7, who had congenital syphilis, and his trouble cleared up under injections of salvarsan. The second was in a very hysterical lady, who had a clear infection of pneumococci. This was thought to be an artefact. The third case was that of a lady, whose bacteriological examinations showed on one occasion pure coliform bacillus, next Hoffmann's, and then catarrhalis and staphylococcus. It was obvious, therefore, that the bacteriology of such cases was uncertain.

Polypoid Mass growing from an Enlarged Tonsil. ? Cystic Degeneration.

By E. A. PETERS, M.D.

E. H., SCHOOLBOY, aged 11, underwent an operation for adenoids and tonsils at a London hospital seven years ago. At present both tonsils are enlarged, with evidence of chronic tonsillitis. An irregularly nodular mass 1 in. in diameter projects from the right tonsil below the supratonsillar fossa. The constituent tissue is whiter, but otherwise resembles the tonsil. The usual deep cervical glands are slightly enlarged.

DISCUSSION.

The PRESIDENT said there was no need to suggest that the condition was connected with the operation. He had seen the same in tonsils which had not been operated upon. In a case of the kind he snipped off the growth with scissors and sent it to Dr. Wingrave, who reported it as cystic, granulation tissue and ordinary tonsillar tissue.

Dr. DAN MCKENZIE thought that if the operation had not been incomplete the recurrence would not have occurred. Mr. Hett had pointed out that the growing layer of the tonsillar cells was close up to the capsule, and in this case the recurrence of tonsillar growth had probably spread from that situation. The surface of the growth seemed to be cystic. This case, like that of Mr. Jefferson Faulder and Mr. W. H. Harmer, supported those who advocated enucleation of the tonsil as the routine operation.

Laryngological Section.

January 12, 1912.

Mr. T. MARK HOVELL, Vice-President of the Section, in the Chair.

Case of Paralysis of the Left Vocal Cord.

By ANDREW WYLIE, M.D.

FEMALE, aged 21, suffering from hoarseness of twelve months' duration. On examination there is a complete paralysis of the left vocal cord, also a small adenoma in the thyroid gland which is said to have grown within the last twelve months; patient gives a vague history of receiving an injury to the neck. There is no sign of aneurysm or mediastinal growth, and no tuberculous or specific history. The patient complained of difficulty in breathing when lying down, but has been better since the adenoma was removed by exhibitor six weeks ago. Dr. Wingrave reports that "It was enclosed in a firm, fibrous capsule, which on cutting seemed to contain only blood partially coagulated and dark in colour, completely masking all other tissue. On washing away the blood a soft, reddish substance was seen, which proved to be an adenoma with very scanty and imperfectly developed thyroid tissue on its outer surface."

The question is whether the injury to the neck caused an interstitial inflammation which affected the left recurrent laryngeal nerve, the result being paralysis.

DISCUSSION.

Dr. JOBSON HORNE, in support of the suggestion that an injury to the neck might cause paresis of the left recurrent laryngeal nerve, cited a case that came under his notice some twenty years ago, and before the analysis of the thoracic organs by means of the X-rays had been developed. The patient,

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a middle-aged man, complained of thoracic symptoms, suggestive of mediastinal disease and probably aneurysm. He also had fixation of the left vocal cord. Upon closer examination it was found that he had not only fixation but also a good deal of atrophy of the left vocal cord, and no thoracic physical signs of disease. Upon further investigation of his life-history it was elicited that in childhood an attempt had been made to destroy his life by strangulation; hence the laryngeal condition. External examination showed the larynx obviously atrophied on the left and displaced to the right side. Hence the clinical importance of examining the outside before looking inside.

Mr. HERBERT TILLEY asked whether the growth was found to be, on removal, a deep one—i.e., whether during the operation the deep regions of the neck were invaded. A surgeon of long experience told him that one did not usually damage the recurrent laryngeal nerve unless one saw it during the operation. Possibly the recurrent laryngeal might have been damaged in this case during the operation by pressure or by bruising; it was difficult to imagine that the normal inflammation following a clean operation would cause paralysis. If that theory were correct, it would be more often found in those extensive operations for the removal of large goitres, which were being performed so frequently nowadays.

Dr. DAN MCKENZIE asked if Dr. Wylie ascribed the thyroid tumour also to the injury. The notes said it consisted largely of blood partially coagulated. Although there was also adenomatous tissue, pathologists said it was not infrequent in cases of hæmorrhage into the substance of the gland for the blood to become encapsuled, and adenomatous tissue to grow from the sides of the capsule. The tumour in the thyroid might have been responsible for the paralysis. He asked if the tumour was in a position in which it would exert pressure on the recurrent laryngeal nerve.

Mr. SOMERVILLE HASTINGS said that some eighteen months ago he had shown a case of bilateral paralysis after operation on the thyroid gland. There was complete paralysis of both cords, and most of the members of the Section who discussed the case said there was but little chance of recovery. He had, however, received a note from the patient's doctor, stating that she had now quite recovered her voice.

Dr. KELSON asked when Dr. Wylie noticed the paralysis, as that fact might throw light on the pathology. He believed that after many operations on the thyroid there was a temporary paralysis. He had seen many, and generally they recovered, but often the condition was not noted because not looked for.

Dr. WYLIE, in reply, said the patient came to him with hoarseness, and examination showed the same paralysis as was now present. She said she had received an injury through playing with her brother, who caught her roughly round the neck. The paralysis was not due to his operation; it was there long before he operated. The swelling in the neck appeared after the

injury. He removed the small adenoma, thinking it might have some effect. He brought the case because the patient complained of an injury which he thought might be a cause for the paralysis. Dr. Hill and Dr. Jobson Horne had described cases in which that was so. As no aneurysm or mediastinal growth was diagnosed, and the adenoma was too superficial and small to be the cause of the paralysis, he thought this might have been caused by the injury.

Papillomata on both Vocal Cords.

By ANDREW WYLIE, M.D.

FEMALE, aged 40, suffering from large papillomata on both vocal cords: a large one and two smaller ones on the right vocal cord, nearly filling the glottis. The patient has been under the exhibitor's care for six years and the growths have been removed completely eleven times by means of various forceps and snares, and cauterized on two different occasions, both by direct and indirect methods. The removal of these papillomata by forceps or cauterization does not prevent their recurring and the exhibitor considers it may be advisable to open the larynx and curette them.

DISCUSSION.

Mr. HERBERT TILLEY remarked that Dr. Wylie seemed to consider it advisable to open the larynx and curette the papillomata. He wondered what were his reasons for so doing—i.e., whether he hoped it would cure, or whether it would permit of more thorough removal. Laryngologists knew that even when the larynx was split, and the papillomata carefully removed, it did not follow that cure would result. There was a record of one child who had been thyrotomized seventeen times. He had seen the larynx split on more than one occasion, and though there was most drastic removal of the growths, yet they returned just as freely as if other means had been employed. Before that was done in this case he suggested that after removal of the papillomata by the direct method their bases should be touched with a pencil of carbonic acid snow. This produced good results in warts and other conditions of the kind. Or one might try a 20 per cent. solution of salicylic acid in absolute alcohol. Unless some such thorough treatment were adopted, one could scarcely expect a cure, for, as in treating corns, it was of little use unless one got well down into the sub-epidermal tissue. He had now under his care a boy who (it was said) had had forty-seven operations on his larynx; during the last five years he had removed every three or four months many papillomata from the larynx, and yet they recurred. The last time he came to the hospital there was one papilloma on the tonsil and one on the posterior wall of the pharynx, which seemed to show that such growths were locally infective.

Dr. JOHNSON HORNE, although he had performed thyrotomy for the removal of papillomata of the larynx in an extreme case in an infant, did not advise thyrotomy in this case. When, in his experience, one commenced to clear out papillomata from a larynx, at first they appeared to grow more rapidly. Experience taught him to go ahead, daily if necessary, and to effect a clearance, and not to wait for a material and definite recurrence. At what appeared to be the finish there usually remained one or two hidden beneath the edges of the anterior ends of the vocal cords. Upon asking the patient to phonate they came to the surface, and could be snipped off by double-cutting curette forceps. He had split the thyroid cartilage for the removal of papillomata in a child aged 12 months. Upon laryngoscopic examination the basin of the larynx presented the appearance of being full to the brim with miniature bunches of red currants which hung over into the opening of the œsophagus. The condition occasioned a symptom not commonly described. The child, according to the mother, had a habit of soaking all dry food in tea or milk before attempting to swallow it; in a word, the child had experienced dysphagia in trying to swallow its papillomata. When first seen the child was nearly moribund with bronchopneumonia. A tracheotomy tube for croup had been worn for no small part of a short life. Dr. Horne, with the assistance of Mr. Clayton Fox, opened the larynx, removed the papillomata, cauterized their bases, closed the larynx, and left in the tracheotomy tube. Subsequently an intubation tube was inserted and the tracheotomy wound allowed to close. The intubation tube was coughed up and the child spoke for the first time. After some years Dr. Horne had not heard of any recurrence of the growths, but if there had been a recurrence he probably would have been informed.

Dr. DUNDAS GRANT asked what form of chemical caustic was employed. Many years ago he advocated salicylic acid applications, and he still had reason to believe in them.

Dr. DAN MCKENZIE said that dermatologists used carbonate of magnesia internally in cases of warts on the skin, with excellent results. He had tried it in one or two cases of papillomata of the larynx. One of them was a little girl shown last year whose larynx he had cleared by the direct method. She had been taking carbonate of magnesia for a year, and so far there had been no evidence of recurrence.

Mr. CLAYTON FOX said that numerous cases had been recorded in France cured by giving calcined magnesia internally.

The CHAIRMAN (Mr. Mark Hovell) said the treatment he had found best in papillomata of the larynx was removal, and then removal again immediately the growths reappeared, but not to wait for them to get as large as in this case. Though in some cases there seemed to be a temporary increase due to the irritation produced by removal, yet if immediate removal was persisted in, the area would become smaller, and, finally, the growth would disappear. He had seen more than one case in which there was an absence of recurrence.

Dr. WYLIE, in reply, said he had removed the growths so many times that he had become disheartened. He cauterized them with several agents, such as salicylate of soda, zinc chloride, &c., and also with the actual cautery, by the indirect method, and then the direct method. By the latter it was so thoroughly done that the patient was ill afterwards for a couple of months. She was cured for some time, but there was again recurrence. He would certainly try the carbon-dioxide snow, and would report the result.

? Pachydermia of the Right Vocal Cord.

By ANDREW WYLIE, M.D.

MALE, aged 55, brass finisher by trade, suffering from hoarseness for six years, and has been under exhibitor's care for four years. During that time there has been little change in the condition of the larynx. On examination the right vocal cord moves very sluggishly and is completely covered by a hard, horny, white growth. Twelve months ago a piece was removed by means of Whistler's forceps and Dr. Wingrave could not find any malignant tendency. The exhibitor has refrained from touching it again as interference might irritate the growth. No enlarged glands, no history of syphilis, and although potassium iodide and mercury have been administered in large doses there has been no improvement. The patient declares he is perfectly well except for the hoarseness. No loss of weight, eats and sleeps well, and nothing to complain of but fatigue after speaking.

DISCUSSION.

Mr. CLAYTON FOX did not consider that the case had the features of ordinary pachydermia, except that there was a mass of keratosis present. It was more like the condition described as frosted freshly mown grass. In view of the patient's age, he believed it would eventually be malignant. It should be investigated as soon as possible, and if epithelioma were found, prompt removal should be carried out.

Dr. JOBSON HORNE agreed that there was no evidence of pachydermia laryngis. He believed the frosted appearance on the edge of the cord was held by some to be pathognomonic of malignant disease, but he did not entirely accept that suggestion. Nevertheless, malignant disease should be borne in mind in this case. The larynx should be watched. If possible, and without interfering with his livelihood, absolute silence should be urged upon the patient.

Dr. PEGLER remarked that Dr. Scanes Spicer had shown a case which presented the frosted appearance mentioned. The man eventually underwent laryngo-fissure and died soon after of pneumonia.¹ The section in the cabinet showed a distinct change from the original microscopic appearance of the growth; for whereas, in the earlier stages, one distinguished the characters of a squamous papilloma crested by horny cells, giving rise to the delicate white peaks seen with the laryngoscope, the later sections showed pearly cell-nests suspiciously invading the papillomatous tissue. Another case, of keratosis laryngis, but showing no malignancy, had been exhibited by Dr. Logan Turner, also referred to in volume xiii of the old Society, and sections preserved in the Collection. He remembered the series of microscopic preparations of Mr. Mark Hovell's notable case perfectly well, and had catalogued it in all its phases as squamous papilloma.

Mr. HERBERT TILLEY agreed as to the likelihood of malignancy. If he had that condition in his own throat he would not waste time, either in vocal rest or any simple measures, but would ask a friend to deal with it at once by radical measures. The base of the growth did not seem to move so freely as it ought to. It should be radically operated upon, not merely snipped off. He thought one was justified in splitting the larynx and thoroughly eradicating the lesion. He could not speak from any experience of this particular growth, as the condition was a rare one. Possibly the condition had only a low degree of malignancy.

Mr. MARK HOVELL said the condition was certainly rare, and he had only treated one case. The patient, a stoker at the Gas Works at Westminster, came scarcely able to breathe, as the growth was a very large one. He removed it by the intralaryngeal method, and it came away easily. A few shreds were left, but they were removed on a subsequent occasion. He did not see the patient again for a year, and then he returned with the growth almost as large as before. The growth was again removed by the intralaryngeal method, but it was more difficult this time, as it was more adherent. There was no recurrence, though he kept the patient under observation until he died, eight or ten years afterwards, from pneumonia. He regarded the condition as a slow form of malignancy, although in his case there was no recurrence. Remembering the success in that case, he thought removal by the intralaryngeal method might be attempted, although the operator might be prepared to split the larynx and scrape out that side if there were any sign of recurrence.

Dr. JOBSON HORNE suggested that the microscopic specimens in the Society's cabinet from cases which had been referred to might be put under microscopes at a future meeting for members to examine and discuss.

¹ *Proc. Laryng. Soc. Lond.*, 1906, xiii, pp. 50, 82; and *Proc. Roy. Soc. Med. (Laryng. Sect.)*, 1908, i, p. 81, and 1909, ii, p. 160.

Dr. WYLIE, in reply, agreed that the malignancy must be of low degree. He queried the term pachydermia in order to raise a discussion. As the man had had the condition six years, and there was no apparent change, it would be difficult to get him to agree to an operation, which he considered must be a thorough splitting of the larynx and proper removal. If one began with endolaryngeal methods, the condition might be made worse.

Swelling of the Right Ventricular Band and Vocal Cord in a Man, aged 40.

By W. H. KELSON, M.D.

A. L., WAREHOUSEMAN; history of syphilis six years ago. Lungs appear normal; no tubercle bacilli found in sputum, which is very scanty. Slight hoarseness began five months ago. The larynx is congested, particularly on the right side, where the ventricular band is seen to be swollen, partially eclipsing the view of the right cord, which also appears swollen. Iodide of potassium up to $\frac{1}{2}$ dr. three times a day has been given without effect.

DISCUSSION.

Mr. HERBERT TILLEY asked if the man had had inunction of mercury, and if the Wassermann test had been carried out. If this was positive, he suggested that inunctions should be tried.

Dr. LIEVEN (Aix-la-Chapelle) thought the case was one of syphilis, and that energetic treatment with strong mercurial inunctions would be beneficial. They should be stronger than were usually given in England. He recommended 6 gm. to 8 gm. of blue ointment, as such diffuse swellings in the larynx disappeared only slowly. In any case a Wassermann test should be done and if this were positive two or three injections of salvarsan should be given. It ought to be combined with mercury, as thereby the chances of turning the positive reaction into a negative one were greater.

Dr. KELSON, in reply, said the man had not had mercury, and he brought him up to see if anyone would suggest "606." A Wassermann reaction would be tried. His view was that it was syphilitic, but the resistance to iodide introduced a slight doubt.

**A Case of Atrophic Rhinitis, with Nasal Obstruction, in
a Child, aged 7.**

By W. JOBSON HORNE, M.D.

THE history of the case, briefly stated, is that the child had had discharge from the nose for three or four years which had been yellow and offensive, with nasal obstruction. Two years ago a doctor was consulted, and an operation for the removal of adenoids was performed, but the result was not satisfactory.

Externally the bridge of the nose is depressed. At the present time the post-nasal space is entirely free from any hypertrophy of adenoid tissue and from any other form of obstruction. The middle turbinated bodies are hypertrophied and obstructed with dried secretion and crusts. The inferior turbinated bodies are atrophied.

The case is exhibited as illustrating a condition of nasal obstruction in childhood which might be attributed to adenoids, but which is really due, in the opinion of the exhibitor, to congenital specific disease.

DISCUSSION.

Mr. CLAYTON FOX said he presumed the nasal obstruction was functional, as could be understood by the amount of anæsthesia present. He considered this case a suitable one for treatment by paraffin injection. During the past four years he had been treating patients by this method, using Gault's syringe and cold paraffin. He invariably injected the wax into the tissues covering the inferior turbinated body, but seized the opportunity of any available tissue; on many occasions he had injected into the tissues covering the septum and middle turbinals. All his cases had been either cured or relieved of fætor and crusting.

Dr. DAN MCKENZIE said he had tried paraffin in atrophic rhinitis, but found great difficulty in getting the paraffin to remain in the tissues, on account of the friability of the inferior turbinal.

Dr. PETERS said he had used the method with some success, particularly in cases of moderate severity. To obviate the difficulty he had passed the needle through the cartilage on the other side; he then found the paraffin was not so liable to escape. His efforts had been directed to the floor and the septum, and he thought such cases were most encouraging.

Dr. JOBSON HORNE, in reply, said he showed the case as one of clinical importance, and as illustrating a form of nasal obstruction which might be attributed to adenoids, and also as one illustrating that atrophic rhinitis in a child might be associated with nasal obstruction.

A Case of Hyperostosis Cranii or Leontiasis Ossea.

By E. B. WAGGETT, M.B., and EDWARD D. DAVIS.

HISTORY: The patient complained of nasal obstruction, and of a discharge "at the back of the throat." No pain. He first noticed the swellings of the face at about the age of 16—i.e., five or six years ago—about one month after receiving "a punch on the nose." He has never been abroad.

Present condition: A male patient, aged 22, a paper seller, with symmetrical osseous swellings involving the nasal processes of the maxillæ, and extending on to the facial surfaces of the bodies of the maxillæ. The maxillary antra are opaque to transillumination, but the frontal sinuses are normal. Both sides of the nose are obstructed by the hard osseous swellings, which can both be felt and seen projecting into the nose. The infra-orbital margins are involved, and there is lachrymal obstruction on the right side, but in other respects the orbits are apparently normal. In addition, there is a diffuse smooth swelling of the body of the mandible, to the right of the mental eminence, and surrounding the mental foramen. The teeth are carious, and there is considerable oral sepsis. The left ear is normal, but there is old otitis media on the right. The optic disks are normal. There are neither signs nor history of syphilis, but the Wassermann reaction is positive.

Skiagrams show both maxillæ occupied by dense masses of bone.

DISCUSSION.

Dr. JOBSON HORNE said the case was a very unusual one, and he regarded the title of hyperostosis cranii or leontiasis ossea as insufficiently concise, because the increased growth of bone appeared to be limited to the maxillæ. If it had involved the entire cranium one would have expected some obstruction of the auditory meatuses and in other parts. Speaking from memory, he had some recollection of a specimen in the Museum at St. Thomas's Hospital, the skull of a woman who died many years ago, and who was known in the neighbourhood of Billingsgate fish market as "Ugly Sally." She had that same condition, but more advanced; there were great bulgings on both sides of the nose, limited to the maxillæ. He believed the causation of the disease was a microbic infection. A similar condition was found in the Tropics. Infection seemed to be through the nose. In all such cases there was no difficulty in obtaining a history of injury.

Dr. KELSON said that in 1908 he showed a case which was practically the counterpart of this. The patient was a man, aged 30. The condition did not exactly coincide with leontiasis, nor with the cases described as occurring on the Ivory Coast, in which the swellings occurred on either side of the nose. His patient came complaining of nasal obstruction, but there was no pain; he proceeded to cure his nasal obstruction, and, after turning back the mucous membrane, took a chisel to remove the bone; it was, however, of egg-shell consistency, and the operation was unexpectedly easy. The wound healed up readily and the patient was out of the hospital in a few days. There was no history of syphilis.

Dr. LIEVEN drew attention to the fact that there was a relation between local injuries and the production of a gumma (irritation and syphilis). He mentioned a case, quoted in French literature, in which, as a result of a blow on the nose by a latch-key during a fight, a gumma developed at the site of the injury. He thought this to be a case of syphilis, especially as the Wassermann reaction was positive.

Mr. EDWARD D. DAVIS, in reply, said he would give the patient iodide and mercury for a few months. If the Wassermann reaction then proved negative and the patient improved, it might be assumed that syphilis had caused the condition. A very good specimen of similar character existed in the Museum of the College of Surgeons, but the one at St. Thomas's mentioned by Dr. Horne was more pronounced. In the skiagrams the skull-bones were found to be abnormally thick, especially the parietal and frontal. After careful inquiry into the nature of the injury he believed it had nothing to do with the man's condition, as the lower jaw was not injured. In all the cases reported in English syphilis was denied, with the exception of one, which was reported by Sir Anthony Bowlby, who considered that there was a suspicion of syphilis. He referred members to an article by Sir Victor Horsley in the *Practitioner* for 1895. Sir Victor operated upon five of these cases, and the growths were considered to be inflammatory. There was a thickened periosteum, and Sir Victor said that the new bone was osteoplastic and osteoclastic.

Tuberculosis of the Retropharyngeal Lymphatic Glands.

By DAN MCKENZIE, M.D.

Case I.—A little girl, aged 6, came to hospital on June 22, 1910. On examination a soft, fluctuating swelling was discovered in the posterior pharyngeal wall to the left of the middle line. Some hard, enlarged glands could be felt in the carotid region. The patient was also suffering from adenoids. Under chloroform the retropharyngeal

¹ *Practitioner*, 1895, lv, pp. 12-25.

swelling was incised and about $\frac{1}{2}$ oz. of pus evacuated. In October, 1910, the adenoids were removed. In December, 1910, the swelling in the posterior pharyngeal wall reappeared. At first this swelling was firm and fleshy and seemed to be solid, but when the patient was anaesthetized fluctuation could be made out. The abscess was freely opened on May 8, 1911, and its walls thoroughly curetted. Healing followed in about a fortnight. There is a history of tuberculosis both on the maternal and on the paternal side of the family. Both the von Pirquet and the tuberculin injection tests gave a marked reaction.

Case II.—Also a little girl, aged 5. After an attack of scarlet fever (with otorrhœa, which dried up in four months) the mother noticed a swelling in the child's neck in April, 1911. On examination the swelling was found to be a chronic retropharyngeal abscess, which was pointing in the neck behind the right sternomastoid. In June the abscess was opened at this place and we found it easy to pass the finger up into the retropharyngeal subaponeurotic space. After evacuation the walls were lightly curetted, iodoform glycerine was injected, and the wound was sutured. Healing ensued.

In both cases careful search, both before and at the operation, failed to reveal any signs of spinal caries, and the probability that the disease originated in retropharyngeal lymphatic adenoid tissue is overwhelming. I understand that a suggestion has been made that cases like the second, with an abscess passing behind the great vessels into the pre-vertebral space, not arising from spinal caries, may be due to the burrowing in two different directions of pus, &c., from broken-down tuberculous glands in and about the carotid region. But the first of these cases shows that tuberculous abscess of the retropharyngeal lymphatic gland tissue does occur, and, that being granted, the likelihood of an abscess from this source occasionally finding its way out into the neck cannot be denied, especially when it is remembered that abscess from caries of the upper cervical spine points sometimes in the pharynx and sometimes behind the sternomastoid in the neck. Thus these cases may be regarded as illustrating two types of the same disease—namely, tuberculosis of the retropharyngeal lymphatic glands.

DISCUSSION.

Mr. CLAYTON FOX said these cases were interesting from the fact that generally only acute abscesses were found in connexion with Gillette's glands. These structures were supposed to disappear at about the third or fourth year. Possibly in these cases the glands were infected with tubercle before involution

was complete. But it was conceivable that suppuration arose primarily in the latero-pharyngeal glands and that the pus burrowed through Charpy's lateral aponeurosis into the retropharyngeal space.

Dr. DAN MCKENZIE, in reply, said he thought the cases of interest because they formed the completion of a series of cases of tuberculosis affecting the pharynx, which had been shown before the Section during the last two years.

Swelling in Region of Left Tonsil.

By FRANK ROSE, F.R.C.S.

(For W. D. HARMER, F.R.C.S.)

FEMALE, aged 61. Two months ago a crust stuck in her left tonsil. She removed the crust with her finger. Since then her throat has been sore, causing discomfort when swallowing. There is a large smooth swelling in the situation of the left tonsil, occupying the entire cavity of the oro-pharynx and extending below to the level of the epiglottis. There is a deep cleft in the anterior surface, and its anterior inferior surface is ulcerated. A firm swelling can be felt externally in the neck. Opinions are invited as to the nature and treatment of the swelling.

DISCUSSION.

Mr. HERBERT TILLEY said probably no one would like to give a very positive opinion about this case, because it was unlikely that any member had seen anything exactly like it before. One could not be sure it was not a primary syphilitic lesion. She said that two months ago a crust stuck in her left tonsil, but the tonsil might have been contaminated with the syphilitic poison by this means. There were enlarged glands in the neck. The question of syphilis should be investigated before any drastic operative procedure was adopted. If syphilis could be excluded, there was nothing for it but a major operation.

Dr. LIEVEN agreed with Mr. Tilley that this might be a case of primary syphilis of the tonsil. But as the clinical signs of tonsillar chancre were in a great many cases very indefinite, a point on which he had laid stress in his monograph on syphilis of the upper air passages, he could not give a definite diagnosis. Spirochaetæ should be looked for, although it was exceedingly difficult in such cases to demonstrate their presence. In early primaries the Wassermann reaction was invariably negative and therefore one should adopt

the old method of waiting until the appearance of secondary symptoms or a positive Wassermann; in this case more especially, as if an operation were to be performed it would necessarily have to be very extensive.

Dr. DUNDAS GRANT said that the cases of primary specific infection of the tonsil which he had seen had not presented the same appearance. They looked more diphtheritic and there was not much enlargement of the tonsil, especially when compared with the enlargement of the glands. In the present case the external glands were very small compared with the enormous size of the tonsil. To him it looked more like localized lymphadenoma or lymphosarcoma.

Mr. ROSE, in reply, said his opinion when he first saw the case was that it was a growth, and that was still his view. He regarded it as malignant. The question was whether it was lymphosarcoma, or one of the endotheliomata which sometimes occurred on the lateral wall of the pharynx. He had never seen an appearance of the pharynx like this one. If it was a malignant growth he would not hope much from operation. The best chance for the patient was that it might turn out to be inflammatory. He would remove a piece for examination, and from that he would judge what was best to be done. This would give time for the eruption to occur if the suggestions of Mr. Tilley and Dr. Lieven turned out to be correct. The swelling was firm and did not give the idea of œdema; it was of the consistency of a soft fibroma. The finger could be passed between it and the posterior pharyngeal wall. It did not invade that wall at all.

Case of Tuberculous Laryngitis. Acute Herpetoid Condition.

By J. DUNDAS GRANT, M.D.

WHEN first seen on January 2 the patient complained of intense pain, especially when swallowing, for three days, but for two months previously he had experienced slight pain. In the larynx was seen extreme infiltration of the left half of the epiglottis and aryepiglottic fold, with small herpetic spots. The right half of the larynx was very slightly infiltrated, but the vocal cords were normal. Pulmonary physical signs of tuberculosis are present, and the tubercle bacilli have been found in the sputum.

He was ordered to suck ice, and to inhale, by means of Leduc's tube, a powder consisting of equal parts of anæsthesin and orthoform. A week later the pain had considerably diminished, and several shallow oval lenticular ulcers with white edges were seen on the infiltrated regions on the left half of the larynx.

Dr. DUNDAS GRANT added that the question was whether it was a case of localized miliary tuberculosis, or a herpetic condition on top of a tuberculous infiltration. It was confined to one half of the larynx, and when he saw the case nine days ago there was acute inflammation, with appearances on the surface which resembled blisters. There were now small lenticular ulcers, and the question was whether they were herpetic. If they were so they might shrivel up. He would report on the case later.

**Report on Mr. Bain's Specimen of Papilloma growing from
the Inferior Turbinate.¹**

THE Morbid Growths Committee report that the section for microscopical examination has been submitted to Members of the Committee and Mr. Shattock. All agree that it shows the structure of an innocent papilloma.

¹ See *Proceedings*, p. 53.

Laryngological Section.

February 2, 1912.

Dr. STCLAIR THOMSON, President of the Section, in the Chair.

Specimen from a Case of Discrete Angioma of Nose.

By HERBERT TILLEY, F.R.C.S.

REMOVED from a young man, aged 17, who applied to hospital for severe attacks of nose bleeding, which had rendered him very anæmic and weak. The tumour was situated on the left side of the septum and grew from an area corresponding to the junction of the triangular cartilage of the septum with the central plate of ethmoid.

PATHOLOGICAL REPORT BY H. G. BUTTERFIELD, M.B.

"The specimen sent for examination is a bleeding polypus of the nasal septum, and consists of a soft piece of tissue concave on one side, convex on the other, and divided into two lobes by a cleft at right angles to the longer diameter. The colour is patchy, and a large portion of the surface appears to be hæmorrhagic. For the microscopical examination a small piece of tissue, including both lobes and the hilum common to each of them, was removed from the centre of the specimen. Over the greater part of the external surface of the mass the epithelium has disappeared, but that which remains has the characters of a thin, squamous epithelium, while in the depths of the cleft it assumes a columnar character. The structure of the tissues subjacent to the ulcerated portions is completely obscured by extravasated red blood corpuscles and polymorphonuclear leucocytes. Under the intact and healthy epithelium there is a narrow peripheral zone of tissue which, in structure, differs only from that of the ordinary œdematous nasal polyp in that it is somewhat more cellular. The central portion of the

mass consists of a few broad strands of well-formed connective tissue radiating from the hilum and supporting an extremely cellular connective tissue stroma containing an abnormal number of vessels of all sizes. The larger of these possess a definite endothelial lining in which the nuclei are more numerous and prominent than usual, while the remainder of their walls is continuous with the stroma and indistinguishable from



FIG. 1.

From a section made in the vertical plane of the pedicle and stained with hematoxylin and eosin. It shows primarily a large blood space located in one of the numerous fibrous bands that radiated towards the periphery of the growth. Numerous smaller blood spaces are scattered throughout the field, especially its upper part; everywhere surrounded by the cell proliferation which characterized this specimen and fixed its type.

it. Many of the smaller appear as mere spaces in the connective tissue stroma, and are only distinguishable as vessels by their containing blood corpuscles. Apart from the strands radiating from the hilum there is no definitely collagenous connective tissue in the specimen. There are

no abnormal mitoses to be seen throughout the whole of the tissues. Numerous Gram-staining cocci were found on the ulcerated surface and in the subjacent tissues as well as in the endothelial cells of some of the larger vessels. The specimen shows none of the characteristic features of a malignant growth of a sarcomatous nature. The characters are those of a hæmangioma."



FIG. 2.

From the same section, but a different part, and more highly magnified. It shows that the proliferated cells are of the so-called endothelioid type, numerous lymphocytes being interspersed. In the field selected, which is just above that of fig. 1 and nearer the seat of attachment, the vascular channels are particularly close, and the stroma between them correspondingly scanty. The fibrous constituent of the strand entering on the left and approaching two converging blood channels is well shown.

DISCUSSION.

Dr. PEGLER said this specimen belonged to a rather unusual class—viz., the connective tissue type of fibro-angioma, which, though intensely vascular, displayed a dense crowding of endothelioid cells, and marked cell proliferation around the vessels. The cells in question were those which, during the period

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when these growths were less well understood, had so often led to a mistaken diagnosis, and consequently to not a little anxiety from the clinical point of view, especially when microscopic appearances were taken into consideration with the recurrence that usually followed upon incomplete removal. The term "Sarcomatoid" (angioma sarcomatodes) had been employed for the type by certain foreign authors, and he rejoiced to see by contrast such a truly accurate and scientific description of the present growth furnished by Mr. Butterfield.

Mr. ROSE asked whether there was evidence of ulceration or inflammation in the nose preceding the formation of the swelling; also what was the occupation of the patient, especially in reference to alcohol. In two cases under his own care the patients were bar-tenders.

Mr. TILLEY, in reply, said the growth was only ulcerated where cotton-wool or gauze had exerted pressure on it in the effort to stop the bleeding. He did not know the patient's occupation. He exhibited also another specimen, from a gentleman aged 69, who came to his house that morning on account of violent bleeding of the nose. The growth filled the entrance to the nasal cavity just beyond the vestibule, and he (Mr. Tilley) at first thought it might be malignant. On touching it with a cocaine mop it bled at once and very freely. He put Meyer's knife ring behind it and removed it, and then applied the cautery to the base. There was now only a black patch where the stump was cauterized. The septum was very much deviated into the right nostril, and the growth took its origin from just below the maxillary crust in the left nasal cavity.

Enlargement of the Nose in a Patient suffering from Nasal Polypi and Pansinusitis.

By HERBERT TILLEY, F.R.C.S.

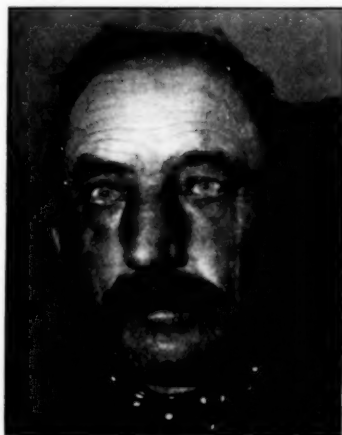
J. F., MALE, aged 52, applied for relief of nasal obstruction which was found to be due to multiple polypi. Pus and muco-pus can be evacuated from all nasal sinuses. Many polypi have been removed, and the sinuses irrigated. The nose is very much enlarged (*see figure*), especially in the region of the bridge, where considerable periostitis seems to be present. The upper regions of the septum are also very much thickened.

DISCUSSION.

The PRESIDENT (Dr. StClair Thomson) said that he once had a run of such cases, and thought there must be some periostitis of the nasal bones; but the enlargement went down in many cases after removal of the polypi.

But there were others, of which this case seemed to be an example, in which it did not seem to subside at all. He tried all the antiphlogistic methods, but although the noses were clear and the sinuses were treated, the patients continued to have the pain until they disappeared from view. They were all hospital cases. Before the days of the Wassermann reaction he thought there was a syphilitic basis, and so gave the patients courses of iodide and perchloride of mercury, but without benefit.

Dr. DAN MCKENZIE said he did not know whether swelling of the upper part of the septum in suppuration of ethmoidal polypi had been remarked upon. Edema there was not infrequent, definitely localized to the upper part of the



Enlargement of the nose in Mr. Tilley's case of nasal polypi and pansinusitis.

septum, and not extending any further downwards than the lower edge of the ethmoidal portion. It seldom or never gave rise to polypus formation. This was an interesting point to note, in view of the theories advanced as to the origin of polypus formation in the nose.

Dr. FITZGERALD POWELL said this was a very interesting case, and in many that had come under his care, especially where the polypi had existed in numbers and for a long period, he had observed atrophy of the ethmoid bone; and often, as in this case, a thickening of the nasal bones, as a result of a periostitis. In a number of such cases he thought there might be a syphilitic basis to account for the thickening. He would have liked to discuss the treatment, but recognized that it would not be in order to do so.

A Case of Ulcerated Growth of the Larynx.

By J. EVERIDGE.

THE patient, an actor, was well until two months ago, when he noticed increasing hoarseness. This has been gradually getting worse since then. There has been no pain or difficulty in swallowing and no cough. Patient thinks he is losing weight. There is no history of syphilis, and a Wassermann reaction was found to be negative.

A swelling is seen occupying the anterior fourth of the right ventricular band; the inner surface of the swelling is ulcerated. The cords and the rest of the larynx appear normal. Scrapings were taken from the surface of the ulcer, and an examination for tubercle bacilli was negative. Von Pirquet's reaction was markedly positive, and the reaction with subcutaneous injection of tuberculin is now being tried.

There are no physical signs in the chest or elsewhere, and no enlarged glands can be felt. The opinion of members as to diagnosis is invited.

DISCUSSION.

DR. WATSON-WILLIAMS said the appearance suggested a tuberculous deposit, more than anything else. With regard to the von Pirquet reaction, his experience led him to the conclusion that that reaction counted for very little as a diagnostic method. He cited as an example of its unreliability the case of a female patient with a larynx suggesting tuberculosis, in whom repeated von Pirquet tests were uniformly and undoubtedly negative. The patient was subsequently shown at this Section¹ by his colleague Mr. Wright. Shortly after that she developed a general pulmonary tuberculous condition, and died with typical laryngeal tuberculosis. Tuberculin was much more valuable for diagnostic purposes. He would like to hear the experience of others about the von Pirquet reaction, which for his own part he considered to be so unreliable, both as a positive and as a negative diagnostic test of active tuberculosis.

DR. DE HAVILLAND HALL expressed his concurrence with Dr. Watson-Williams's remarks. Only that afternoon, at the hospital, he had declined to employ the von Pirquet reaction because it was of so little value. He had ceased to use it. It was disappointing in both directions. It was sometimes positive when there was no other evidence of tubercle obtainable, and it was often negative when there was marked tuberculous mischief.

¹ Vide *Proceedings*, 1911, iv, p. 56.

Mr. HERBERT TILLEY agreed that the appearance of the case suggested tubercle, the other alternative being malignant disease, but against the latter was the free mobility of the adjacent cord.

Mr. G. SECCOMBE HETT said that he agreed with Dr. Watson-Williams and Mr. Herbert Tilley that the physical signs in the larynx pointed to the diagnosis of tuberculous laryngitis in this case. Mr. Hett asked Mr. Everidge whether the curetting in this case was for purposes of diagnosis or treatment. In his experience it was not easy to demonstrate tubercle bacilli in scrapings from the larynx where there was no sputum, or the sputum examination was negative, although they could usually be found in such cases of tuberculous laryngitis by staining for tubercle bacilli in sections cut from parts removed.

The PRESIDENT agreed that everything seemed to point to tubercle. The scraping was for diagnostic purposes, and was not very vigorous. It was hoped to find bacilli on the ulcerated surface, most probably from the lungs. It was easy to find bacilli in miliary tuberculosis of the pharynx, but he agreed it was rare to find them in ordinary laryngeal tuberculosis.

Mr. EVERIDGE, in reply, said there had not yet been an opportunity of having the tuberculin reaction done, as the patient would not come into hospital. There was a tuberculous family history; one brother died of tuberculosis of the spine. The sputum did not reveal bacilli.

Case of Thyroid Tumour at the Base of the Tongue.

By CHARLES A. PARKER, F.R.C.S.Ed.

THE patient is a girl, aged 16. Her only symptom is some difficulty in speaking, which has been especially noticeable during the last six months. The thyroid gland in the neck seems very ill-developed.

Opinions are sought as to the best methods of treatment in this particular case.

DISCUSSION.

Mr. WAGGETT said the case was of interest as a surgical problem. The patient could not speak properly, and it was evident from palpation of her neck that she could not afford to lose much of the tumour at the back of her tongue. He thought it should be possible to dislocate the tumour downwards and forwards and to fix it in the new position after splitting the tongue above the hyoid. In a word, he did not see why she should not have the gland dislocated and made into a subcutaneous organ.

Dr. FITZGERALD POWELL said he agreed that this was a thyroid tumour at the base of the tongue. He thought that splitting the hyoid and transplanting the growth in this way was rather a severe operation to

suggest to the patient. He would be inclined to deal with it in a way he had seen Dr. Dundas Grant deal with a very large thyroid tumour far back at the base of the tongue. He shelled it out through the mouth, while pulling the tongue forward. If it was removed in this way a portion might be implanted in the normal position *if no thyroid gland was found*. This growth interfered so much with the girl's speech that he thought it should be removed, even if he had to give thyroid extract.

Dr. WATSON-WILLIAMS said he gathered that there was no thyroid gland in the neck, and it might be well to give, as in cases of thyroid gland enlargement, iodine in a preparation such as iodoglidine, or thyroid gland, or the extract. These sometimes resulted in diminution of the size and might prove helpful in this case, which did not lend itself to operation. At any rate, it might be worth trying before operating, as even a slight diminution in the size of the lingual thyroid would probably meet the necessities of the case.

Dr. KELSON said he did not see why, in this case, the same thing should not be done as in a case of ordinary enlarged thyroid—i.e., removing half. The reason for removing the projecting part was that the girl had so much difficulty in speaking and swallowing, and the results of the operation would not be visible from the outside.

Mr. PARKER, in reply, said he hesitated to operate because he believed there was practically no thyroid gland in the neck, and he thought having to take thyroid extract all her life would be worse for the patient than having a little difficulty in speech. In the only case of the kind he had had the tumour shelled out with remarkable ease and seemed almost loose in the tongue, so that the difficulty suggested by Dr. Hill seemed not unlikely, should Mr. Waggett's suggestion be adopted. Dr. Watson-Williams's suggestion of trying to reduce it by the administration of some form of iodine seemed good. His own idea had been, as Dr. Kelson suggested, to remove part of it and leave the other part to act as thyroid gland.

Swelling in the Right Tonsillar Region in a Woman, aged 24.

By W. H. KELSON, M.D.

PATIENT states that her illness began two months ago with a sore throat, but she was not feverish. She never had throat trouble before. A little later she noticed a swelling at the angle of the jaw, which has gradually increased in size. There has been no discharge from the throat but she noticed a discharge from the right ear a week ago. There is now a firm swelling in the right tonsillar region, and a mass at the angle of the jaw.

DISCUSSION.

Dr. DONELAN thought it was a case of long-standing chronic otitis, at present exacerbated by tonsillitis. The patient admitted a discharge from the ear over a month ago, and she could not say how long. From the amount of granulation tissue in the meatus and its appearance, as well as the tenderness over the mastoid, he thought the whole condition, including the glands, dependent on that of the tympanum, though it was not very common to see such glandular enlargement in these cases. He thought that a thorough mastoid operation and removal of the glandular mass the most suitable line of treatment.

Dr. DAN MCKENZIE said there was a swelling in the lateral wall of the pharynx, behind the tonsil. Possibly it was connected with suppuration of the ear, as pus tracking down from the ear and pointing in the lateral pharyngeal wall was not unknown, although it was very rare.

Mr. TILLEY suggested that the tonsil be enucleated. He believed that under the upper and outer region of tonsil there was a collection of pus, and that this caused the enlargement of glands. He believed that there was also some swelling behind the tonsil. He had only seen pus find its way from the ear into the lateral wall of the pharynx once in twenty years.

Mr. WESTMACOTT concluded that the enlargement of the glands was due to irritation from the ear; it was the situation for adenitis in early cases of obstruction of the meatus. There seemed to be a chronic, almost fibromyxomatous, polypoid condition in the meatus, blocking up the discharge for a considerable time. He thought there was first ear trouble, and then the pus worked down the Eustachian tube, infected the tonsil, and set up peritonsillar inflammation. The enlarged glands were too high to be due to primary infection from the tonsil.

The PRESIDENT said he did not think the tonsil itself was very much enlarged, but it was tilted and pushed forward by a large swelling, possibly tuberculous and glandular, behind it.

Dr. KELSON, in reply, said the case was much altered since he saw it ten days ago; there was now a soft point, and he suspected there was some form of peritonsillar abscess present. Ten days ago there was simply a firm mass, which seemed solid, without fluctuation. He would do as had been suggested, and if he found pus he would deal with the case as seemed best after tracing its source.

Post-influenzal Paralysis of the Soft Palate.

By ANDREW WYLIE, M.D.

PATIENT, a male, aged 30, has always been a healthy man: In the second week of December he was laid up for ten days with an influenzal cold, congested throat, and fever. He returned to work before Christmas-time, feeling weak, but otherwise well. A few days later fluids regurgitated through his nose; solids he could swallow quite easily. By January 7 his speech became nasal or cleft palate in character and he found that he had to hold his nose in order to make himself heard. No specific history. No diphtheritic symptoms and, although a culture has been taken, no Klebs-Loeffler bacilli have been diagnosed.

On examination a bilateral paralysis of the soft palate is seen: sensibility is, to a slight degree, diminished. Except for a congestion and enlargement of the posterior end of the right inferior turbinal the nasopharynx appears normal. The movements of the tongue, larynx and sternomastoid muscle are normal.

Tonics of iron and strychnine have improved the condition.

The exhibitor considers it a case of post-influenzal neuritis simulating the condition more commonly found as a sequela of diphtheria.

DISCUSSION.

Dr. WATSON-WILLIAMS asked for full details of the examination for the Klebs-Loeffler bacillus, for negative results from one examination, or even two, were inconclusive. There were instances in which no bacilli were found, which after death proved to be diphtheria. It was one of the most elusive organisms. One became more and more chary of accepting any other infective organism as the cause of such post-inflammatory paralysis as in this case, though he admitted the occurrence of a true post-influenzal neuritis or paralysis. He was aware that he had himself described cases of non-diphtheritic paralysis of the palate following inflammation of the tonsil, but extended clinical experience left him with a conviction that even after a very thorough and careful bacteriological investigation the evidence that a case was not diphtheritic was not absolutely conclusive, and that so-called non-diphtheritic paralyzes following a streptococcal tonsillitis were in reality instances of an undetected diphtherial element in a mixed infection.

Dr. DE HAVILLAND HALL asked whether Dr. Wylie could give information as to the patient's power of accommodation, and whether the knee-jerks were present.

Mr. WESTMACOTT said that some years ago, at the Children's Hospital, Pendlebury, there were several outbreaks of diphtheria in the wards, and Dr. Ashby and he made a systematic examination of the throats of all the nurses and wardmaids in the wards concerned. Two of the nurses had paralysis of the soft palate without having had symptoms of sore throat; in the throats no diphtheria bacilli could be found, and there was no membrane. On the other hand, there were wardmaids and nurses in whom the bacillus was found who had no illness and no paralyses. They both concluded that it was not reliable to depend entirely upon the reported absence of the Klebs-Loeffler bacillus. Cases were examined but no bacilli found, and yet they developed post-diphtheritic paralysis. He believed such cases as the present one were post-diphtheritic. There seemed to be some idiosyncrasy on the part of the patient which prevented the manifestation of the classical symptoms in certain instances.

Mr. HETT asked whether Dr. Wylie had seen the patient during the time he had a "congested throat." Possibly this was an atypical attack of faucial diphtheria. He had recently seen a lady suffering from lateral pharyngitis of a persistent and chronic character. She had a slight whitish secretion from some enlarged lymphoid follicles on the pharynx, extending up towards Rosenmüller's fossa on either side. Four cultures were made, two from each side: both cultures from the right side were positive as regards Klebs-Loeffler bacilli, while those from the left side were both negative.

Dr. PETERS said he remembered a case in which, after tracheotomy for diphtheria, bacterial cultivation showed Hoffmann's bacillus and the Klebs-Loeffler bacillus in the tracheotomy wound, whereas in the throat there were only Hoffmann's bacilli. In the nose neither were present.

Mr. H. D. GILLIES asked whether cultures of the mucus were taken when the patient had the cold, as in that case influenza bacilli would be discovered.

Dr. WYLIE, in reply, said that when he first saw the case he believed it to be diphtheria. Three cultures were taken by Dr. Wingrave. Both the knee-jerks and the ocular symptoms were normal. He did not see the case when the throat was congested, the patient attended the clinic suffering from paralysis. No culture was taken from the nose.

Skiagrams illustrating (a) the Palliative Action of Radium Salts in Malignant Stricture of the Gullet, and (b) the Advantages of the X-ray Screen for accurately applying a Radium Apparatus in the Strictured Area.

By WILLIAM HILL, M.D.

DR. HILL wished to emphasize the fact that these skiagrams taken before radium treatment, and again six weeks later, afforded unequivocal evidence that improvement in swallowing was due to marked shrinkage of the growth and increase in lumen of the gullet, which could not be explained away as a "bougie effect" but was a genuine "radium effect." The action of radium salts was unfortunately uncertain, but he had shown in a communication made to the Medical Society of London a year ago that remarkable improvement had been attained in ten out of twenty-one cases of gullet cancer which he then recorded, and in no fewer than four of these there had been a temporary local surface disappearance. Two of the latter had since died from inaccessible secondary growth in the lungs. He formerly inserted the Finzi radium apparatus (in which the tubes were connected with a long flexible silver style) by means solely of his (the speaker's) endoscopic funnel with a lateral slot. This lateral slot enabled the œsophagoscopic pin funnel to be withdrawn without disturbing the style of the radium apparatus. During the last year, however, he and Dr. Finzi had modified their former technique. The patient was first examined under a general anæsthetic, the gullet was washed out, the stricture dilated up by endoscopic bougieing, and its upper limit, and if possible its length, ascertained by accurate measurements. If the stricture was very tight his intubation apparatus was inserted for a day or two. The actual application of radium was then made under cocaine in the X-ray room by the aid of the œsophagoscope combined with the X-ray screen. A bismuth meal enabled one to see the exact upper and lower limits of the stricture, and accurately to adjust the one, two, or three radium tubes employed. He understood that an X-ray installation had recently been put up at the Radium Institute in order to carry out this improved technique. Dr. Hill, in conjunction with Dr. Finzi, employed from 150 mg. to 255 mg. of radium bromide in screens of platinum 2 mm. in diameter, the application varying from twelve to twenty-four hours, which was repeated at the end of six weeks. Although he had seen

what to the naked eye looked like a local disappearance of all gross evidence of disease, he had been careful to avoid claiming a cure. Without microscopic evidence one could not claim even a temporary cure; and in the gullet, except in a very early limited growth, one had to reckon with latent peripheral invasions and secondary growths in the mediastinum and lungs. Still, he regarded radium as a palliative which was often highly valuable for a time.

DISCUSSION.

Mr. TILLEY said it was comparatively easy by the direct method to see a growth and to pass the radium into it, but in withdrawing the tube, or by the patient shifting, there might result a slight change in the position of the radium, so that during the time occupied by the treatment the chief effect of the radium might be exerted on comparatively healthy tissue. Careful adjustment of the wire fixed to the radium was required to enable the patient to move his head, for the radium was applied for several hours. The X-ray check was most necessary in order to be sure that the radium was in the centre of the growth. A bismuth meal could be given beforehand so as to aid in the localization of the growth. Dr. Hill had done a service by bringing the pictures forward. He asked what was his experience of radium on that form of growth (squamous carcinoma)? He (the speaker) had applied it in twelve cases, and he wished he could record a case of cure, but so far only relief of obstruction had been secured.

Dr. FITZGERALD POWELL said that Dr. Hill had no doubt very large experience in treating these malignant structures with radium, and he thought it would be of interest to the Section if he would explain fully his method of procedure, and how he dealt with the difficulties of keeping the radium in situ as mentioned by Mr. Tilley.

Dr. HILL, in reply, said that the growth gripped the radium tubes, but in order to keep the whole apparatus from shifting, the upper end of the flexible style was bent so that a pharyngeal angle was formed, which prevented much up-and-down movement, and if shifting had taken place in making the bend this could be seen in the screen picture and a re-adjustment made. The oral end of the style was then suitably bent and fastened at the mouth either to the teeth or a denture, or bandaged against the side of the face outside the mouth. There were, of course, other minor points of technique.

**Case of Growth on Anterior Third of Right Vocal Cord in
a Man, aged 44.**

By JAMES DONELAN, M.B.

PATIENT, a bass singer, had no vocal trouble up to July, 1911, when he caught cold and became very hoarse ; he, however, continued to sing. After some weeks hoarseness disappeared ; about November 1 it returned. Exhibitor saw him for the first time on December 1. There is a partly subglottic growth on the margin of the anterior third of the right vocal cord which at that time was freely movable. Opinions as to the nature of growth and line of treatment are invited, bearing in mind the patient's profession and class of voice.

DISCUSSION.

Mr. H. D. GILLIES suggested that a vaccine might be tried, as he had seen such growths disappear by giving vaccine, in one case of pneumococci and influenza bacilli.

Dr. DONELAN replied that he thought it was a singer's node. It was of somewhat unusual interest in being unilateral while of such large size, and apparently of such long duration. It had, however, diminished considerably during the month's rest the patient had had. If the vaccine treatment suggested could take the place of rest in these cases it was a thing much to be desired, as to secure adequate rest was always the difficulty with professional singers. Notwithstanding what had been said as to the value of vaccines in reducing inflammatory tissue, he felt the best thing for this case would be to continue as far as possible the treatment by rest and sedative inhalations hitherto employed.

**Microscopical Section of a Malignant Columnar-celled
Carcinoma of the Œsophagus.**

By CHARLES W. M. HOPE, F.R.C.S.

THE patient, a male, was aged 25, and for some months had complained of dysphagia and progressive emaciation. On examining by the œsophagoscope, a large growth, in parts polypoid, was found 32 cm. from the incisor teeth. A piece was removed on two occasions and microscoped. The growth bled excessively. The patient eventually died at Guy's Hospital.

Interest centres on a columnar-celled growth in a tube lined by

squamous epithelium in adult life. Is the growth starting from the foetal remains of lining membrane, being columnar ciliated in early foetal, and columnar in late foetal life?

DISCUSSION.

Mr. ROSE did not doubt that it was columnar-celled carcinoma: such were recorded from time to time as occurring in various parts of the œsophagus. But when such a striking example occurred one wondered whether it did not take origin in the stomach or the lowest part of the œsophagus and work upwards. It was a most beautiful specimen.

The PRESIDENT called attention to the fact that the growth was 12 in. from the teeth. The man he showed at the Section two months ago, with malignant disease of the larynx, was now dying in the clinic, and he was only 23 years of age. The present was one of the earliest cases of malignant disease in the œsophagus he had seen in a man.

Mr. HOPE, in reply, said that since sending in the specimens he obtained a report of the post-mortem examination at Guy's Hospital, which stated that the growth was 5 in. long, and extended into the cardiac end of the stomach for about $\frac{1}{4}$ in.; the upper and lower parts were everted, and the whole centre was necrotic. There was a fistula found extending into the pericardium. A few days before his death the man came complaining of pain in the chest. There was pleurisy, and post mortem 28 oz. of muco-purulent fluid were found in each side of the chest, and the pericardium was tightly distended with 12 oz. of pus. The growth just reached to the stomach, and in the liver there were numerous small secondary deposits. He tried very hard to trace the growth, but it had been lost. He did not know whether the growth started in the stomach and spread 5 in. up the narrow tube, but most likely it was primary in the œsophagus.

Abeyance of Nasal Breathing.

By NORMAN PATTERSON, F.R.C.S.

FEMALE, aged 21, domestic servant. Trouble dates from an influenza cold, accompanied by a yellow discharge from the nose, contracted last April. Patient complains of a lump in the throat. Her mother says that if she tries to eat anything solid it has to be forced down with the fingers. She can swallow cake if first of all mixed with milk. During sleep she makes a terrible noise. The senses of smell and taste are lost. The voice varies from time to time and speech is peculiar and difficult. She says "bluther" for "mother," "lloise" for "noise," &c.

Examination shows the anterior nares to be rather narrow, the right

inferior turbinate is full and the septum somewhat deflected. The mucous membranes of the nose and nasopharynx appear to be anæsthetic to the probe. It passes with ease on both sides. Examination of the post-nasal space is negative. On the mouth being forcibly held closed the patient gets distressed, and the face congested. She cannot blow out a candle with the nose, and with some difficulty does so with the mouth. Rapid lip movements are impossible. The pharyngeal mucous membranes show diminished rather than increased sensibility. On depressing the tongue the soft palate is twitched up spasmodically. Laryngeal examination shows good adduction of the cords. The larynx has not been tested for sensation. The upper part of the chest is mainly used in respiration. The patient is said to be obstinate. She showed average intelligence at school. Since a blow on the bridge of the nose fourteen months ago she is said to have become more nervous. Two years ago she suffered from "diphtheritic" throat. There are six other members of the family with a history of ? epileptic fits, ? meningitis in one.

When the patient was first seen during the summer the cauterization was applied to both inferior turbinates, and her mother states that for a month after this she was practically well. About Christmas there was also some improvement in the condition.

DISCUSSION.

Dr. PEGLER said the case reminded him of a case he had shown before the old Society in 1902 on two occasions, first on account of exaggerated and obstinate aphonia, and later for the series of hysterical symptoms which afterwards developed, in which close rhinolalia was a marked feature, and was due to an inco-ordination of the action of the palate muscles. The patient had hemianæsthesia of the whole body, and became for some time an in-patient at the Queen Square Hospital. At present she was able to phonate quite audibly, but the speech defect was as bad as ever. Both the speaker's cases were submitted to a test which he attributed to Lermoyez, and which consisted in holding up the soft palate by means of a tape passed along the nose, drawn out of the mouth, and tied over the upper lip. When the mouth was then closed by the hand placed over it, the patient was forced to breathe through the nose, though only after much struggling and apparently commencing cyanosis. This proceeding had been sufficient to cure the milder case, probably by its moral effect, and he would recommend Mr. Patterson to try it upon his patient.

Mr. NORMAN PATTERSON, in reply, said that he would adopt some such method of treatment as Dr. Pegler mentioned. An interesting point was that for a month the patient was free from symptoms after cauterization of one of the inferior turbinates. That treatment seemed to have acted in a reflex manner.

Production of Lateral Perforations of the Palate by a Tertiary Ulceration.

By E. A. PETERS, M.D.

E. F., AGED 24. The last child is 5 years old and the history is indefinite. The lateral perforations are well marked and are symmetrical; on vocalizing the trabeculae pull on the raphe of the palate. A punched-out ulcer is seen on the left palate and a similar condition was observed during the formation of the perforations. The superficial scars of similar ulcerations are seen scattered over the palate. Pericranial gummata are present.

It is suggested that traction and the avoidance of muscle by gummatous infiltration are the factors in production of these bands. Examination will be made later to ascertain if the palatoglossus is contained in the trabecula.

DISCUSSION.

The PRESIDENT asked whether Dr. Peters had watched the perforations taking place. It was interesting to see that more or less symmetrical perforations could be formed by syphilis.

Dr. DAN MCKENZIE said he could confirm what Dr. Peters said, as the case had been under him before Dr. Peters saw it, and there were then no perforations.

Dr. PETERS, in reply, said he watched the formation of the left perforation carefully. At first the upper part of the perforation was ulcerated and the lower bay cicatrizing; the ulcer was similar in character to that seen now on the palate. The ulcer healed under treatment, leaving the present perforation. Extensive superficial scarring over the thick muscular part of the palate was due to similar ulceration, and the punched-out ulcer and a pericranial gumma were at present evidence of active mischief.

Tumour of Right Lateral Wall of the Pharynx involving the Right Arytæmoid.

By E. A. PETERS, M.D.

D. L., AGED 27, married five years. The first pregnancy occurred a year ago; since that time she has experienced increasing soreness on swallowing, so that it is painful to take even fluids. The patient reports perfect health up to her pregnancy. By the indirect method

a tumour can be seen projecting from the laryngopharynx and pushing the larynx aside; the edge only can be seen, and it overhangs as if it were the edge of an ulcer. The right arytaenoid is red and œdematous. A Wassermann reaction has not been made.

DISCUSSION.

Mr. HERBERT TILLEY said that if Dr. Peters could not determine the nature of the ulcer by the indirect method it should be carefully examined by the direct, because the appearance made him suspicious that there was post-cricoid malignant disease. The first year he was a member of the Laryngological Society he showed a girl, aged 21, with advanced malignant disease in this region, so that age did not exclude malignancy. One point against malignant disease was the intense pain on swallowing, which was not a feature of early malignant disease in that position. If, on the other hand, it was malignant ulceration, it might be possible to remove it by external operation, because it did not seem very extensive at present.

Dr. KELSON said he had had a case of malignant disease in a woman, aged 22, in that situation. The present case was very suspicious of malignant disease, as the right cord did not move properly.

Dr. PETERS replied that he would examine the case by the direct method, to ascertain how far the condition extended. He put the patient upon iodide for a week, but he feared the case was malignant.

Ulcer of the Floor of the Mouth. ? Septic or Malignant.

By GEO. C. CATHCART, M.D.

Miss A. J., aged 42, came to the hospital two days ago, complaining of a sore throat of six months' duration. On examination nothing is to be seen in the throat, but on the left side under the tongue, involving the posterior third, there is an ulcer with a punched-out appearance and everted edges. The left submaxillary gland is also enlarged and hard. There is little pain except on eating. There is no history of specific trouble or of tuberculosis.

DISCUSSION.

The PRESIDENT suspected strongly that it was a case of malignant disease.

Mr. WESTMACOTT regarded the condition as septic. It was similar to a case which was sent to him by a dental surgeon three months ago, in which there was a similar cracked ulcer in the left cheek. Some teeth had given trouble and had been removed. The dentist thought the patient had been inoculated, and that it might be syphilitic; but if it was it was apparently

in the tertiary stage. He (Mr. Westmacott) therefore removed a portion of the growth, and sent two pieces for microscopical examination, and it was reported in both instances that there was no evidence of syphilis, and that it was purely septic. The Wassermann reaction was negative. He applied chromic acid and antiseptic mouth-washes, and it healed. Iodide of potassium had had no effect upon it. There had been very little enlargement of the glands.

Three Cases showing different stages of Cystic Fibromata.

By G. SECCOMBE HETT, F.R.C.S.

Case I: Cyst of Right Vocal Cord.—The patient, a woman, aged 54, has had hoarseness for twelve years. She is in good health, but was urged by friends to be seen for her hoarseness. On examination there is a cystic swelling on the right vocal cord. General health good. No physical signs in the chest.

Case II: Fibroma of Right Arytæmoid.—The patient, a man, aged 32, has phthisis. No throat symptoms. At the routine examination of the larynx (which all inpatients at Mount Vernon Hospital undergo) there was found to be a soft, yellowish swelling attached to the right arytæmoid, which is movable at its base of attachment.

Case III: Cyst of Epiglottis.—A man, aged 29, with phthisis. At the examination of the larynx a cystic swelling, with a solid basal half, was seen attached to the lingual surface of the right half of the epiglottis.

DISCUSSION.

Mr. HETT said that the cases had been seen within the last month at Mount Vernon Hospital together with another case of cyst of the left arytæmoid. He thought that the pathology of the series was the same, and that they showed different stages of cystic fibromata. The growth on the right arytæmoid (Case II) looked solid, but a fourth case which seemed precisely similar had been found to be partly cystic on removal. The growth on the epiglottis (Case III) was half solid and half cystic, while the growth on the vocal cord (Case I) was entirely cystic. With regard to treatment, Mr. Hett proposed to remove the growth from the vocal cord with Paterson's forceps by the direct method. He did not propose removal in the other two cases, as they were not causing symptoms. In the fourth case of cyst of the left arytæmoid (not shown) it had been removed by the indirect method with arytæmoid punch forceps, as it was interfering with the movements of the larynx. It had healed well.

Mr. PARKER said he thought that Case I was a soft fibroma, not a cyst.

Dr. FITZGERALD POWELL thought it was a mucous cyst of the cord, and that it should be touched with the cautery. That seemed to be the safest way of dealing with the condition, and it would leave no ill-effects. The cautery, he thought, was a much safer way of dealing with these cysts of the larynx than any other.

The PRESIDENT said he had a similar growth not long ago which he seized with Mackenzie forceps and removed, but on looking at the forceps afterwards there was very little in them; but that morning the patient turned up with a decided recurrence. He would now apply the galvano-cautery.

Mr. TILLEY said he first thought the swelling under discussion was cystic and coming from the ventricle of Morgagni on to the cord. The patient was then gagged, and on looking again the tumour was in the arytaenoid region.

Case of Tonsillar Neoplasm in a Young Woman, the subject of Tuberculosis.

By J. DUNDAS GRANT, F.R.C.S.

THE patient, a young girl suffering from tuberculous infiltration of the left vocal cord and interarytaenoid space, together with pulmonary tuberculosis, was found in the course of examination to have an elongated outgrowth from the lower part of the left tonsil, pale and perfectly smooth, presenting the appearance of a fibroma. The structure of these growths, of which a number have been brought before the Society from time to time, has varied, and the result of the microscopical examination of the present one will be reported at a later meeting.

DISCUSSION.

Mr. HERBERT TILLEY said it was very like the cases which were shown five or six years ago by Mr. Arthur Cheate and others, including himself. Mr. Cheate's grew from the intratonsillar fossa. Apparently a little tonsillar tissue grew out of a crypt. He did not think the growth had any connexion with tubercle.

The PRESIDENT said he also had shown a similar case. It was simply tonsillar tissue, pedunculated.

Laryngological Section.

March 1, 1912.

Dr. STCLAIR THOMSON, President of the Section, in the Chair.

Larynx showing Epithelioma removed post mortem from a Man, aged 23.

By STCLAIR THOMSON, M.D.

THIS patient was shown before the Society in April, 1911.¹ Although the pathologist reported epithelioma, several members were loth to accept the diagnosis on account of the atypical clinical symptoms. The patient was shown again in November, 1911, when the glands were invaded, and the diagnosis was no longer doubtful. This specimen shows how the disease has, so to speak, consumed all the thyroid cartilage, of which no part exfoliated. It was in this way that the early symptoms—which followed a laryngo-fissure for an apparently simple neoplasm—simulated septic perichondritis.

Combined Tuberculosis and Syphilis of the Larynx in a Woman, aged 43.

By STCLAIR THOMSON, M.D.

THE patient has no physical signs in the chest, but the Wassermann is positive, and tubercle bacilli have been found in her sputum. The larynx shows the deposits of tubercle and syphilis each in a typical form. The interarytænoid space is infiltrated, and both cords infiltrated and abraded, and there are "mouse-nibbled" ulcers on both ventricular bands. The epiglottis is swollen with deposit, and there is a punched-out ulcer in front of each arytænoid.

¹ *Proceedings*, 1911, iv, p. 119.

Double Abductor Paralysis in a Man, aged 42.

By STCLAIR THOMSON, M.D.

PATIENT reports that two years ago he had tracheotomy performed for diphtheria, and wore a tube for eight months; but his voice and breathing were quite satisfactory afterwards, and up to February 10 last. He then was seized with sudden dyspnoea, suffocative attacks, inability to lie down at night, and short breathing. There is no dysphagia nor tracheal tugging. The voice is high-pitched, cracked, and stridulous. There is stridor and dyspnoea even at rest. The glottis is reduced to a mere chink, and only opens in the posterior half. This is due to double abductor paralysis. The left cord is quite fixed in the adducted position. The right cord is almost completely stationary in the same position, but there is slight movement. The cords are sucked together on quick inspiration. The pupils and pulses are equal. There is increased dullness behind and to the left side of the sternum, and a skiagram indicates a mediastinal tumour. Bilateral laryngeal palsy is a rare condition. In 150 cases of abductor paralysis, Avellis found that it was bilateral in only twelve.

Double Abductor Paralysis in a Man, aged 50. Proposed Operation.

By H. J. DAVIS, M.B.

THE patient had syphilis in 1889; in 1894 tracheotomy was performed for an "attack of suffocation." The left arytenoid is fixed, the right hardly moves; the same applies to the vocal cords, which are in the position seen in double abductor paralysis; the larynx otherwise is normal. The patient is willing to work, "but he cannot do so as he cannot breathe." There is no lesion apparently in the chest, and the œsophagoscope shows a normal gullet.

The exhibitor proposes to perform thyrotomy and remove the left arytenoid and cord completely, so as to procure an airway similar to Professor Hobday's ventricle-stripping operation in horses, as suggested by him before the Section a year ago.¹ The exhibitor would like the opinion of members as to its advisability.

¹ *Proceedings*, 1911, iv, p. 87.

DISCUSSION.

The PRESIDENT (Dr. StClair Thomson), referring to his own case, said that since the notes were sent in the man was admitted to a general ward, but he kept the ward occupants awake by the fearsome stridorous noises which he emitted. He then was put in the isolation ward with two other patients, but they were also kept awake by him. He therefore had to be placed in the refractory ward. It was a question whether the noise was due to double abductor paralysis, or to lower tracheal stenosis.

Dr. DE HAVILLAND HALL said that in the President's case there was much difficulty in deciding whether there was single or double stenosis of the air-passages. Early in his career he was called to see a case under the care of Sir Andrew Clark, with reference to tracheotomy. There was bilateral abductor paralysis, but also signs of intra-thoracic aneurysm. He concluded the patient had double stenosis of the air-passages, and that tracheotomy would be of no use. The patient died a few hours later. At the autopsy double stenosis of the air-passages was found. As regards diagnosis, the respiratory excursions of the larynx were of importance. If the obstruction was at the larynx there were usually considerable respiratory excursions of the larynx, whereas if it was due to direct pressure on the trachea the excursions were absent.

Mr. HERBERT TILLEY mentioned the case of a man who was dying with aneurysm of the aorta, which was pressing on his left bronchus so that it had almost occluded it, and produced a curious semi-pneumonic condition of the left lung, in which the secretions were being dammed back. He was in great distress with his breathing, and did not seem likely to live forty-eight hours. Tracheotomy was decided upon, and he procured a König's spiral tube and passed it into the tracheal wound and beyond the obstruction. Great relief was experienced and the patient lived a fortnight without any distress, and was able to make his will and arrange his affairs. In the President's case, the only course which seemed feasible was tracheotomy and inspection of the trachea to see if there was stenosis, and if so, insertion of König's spiral tracheotomy tube.

Mr. MARK HOVELL thought tracheotomy would give the patient relief and allow of further examination.

Sir FELIX SEMON said that thirty years ago he recorded a case of double stenosis of air-passages in the *Transactions of the Pathological Society of London*.¹ The patient was a well-known Belfast man, and the operation was performed by Dr. Byers, on his (the speaker's) advice and encouragement. There was no evidence of a second stenosis further down, and the patient was told that the operation would probably relieve him. But he was only slightly relieved, as there was a second stenosis, due to direct compression of the trachea by a thyroid tumour low down, and he died a few days later. In cases in which there was reason to fear a second stenosis farther down he suggested that the

¹ *Trans. Path. Soc. Lond.*, 1882, xxxiii, p. 38.

surgeon should not give too much promise with regard to the relief which would follow the operation, and that he should be armed with a long flexible tube, so as to pass it, if possible, below the second stenosis. He had great misgivings about the proposal of Dr. Davis to cut out one vocal cord and one arytenoid cartilage. That operation was performed many years ago by the then Veterinary-Surgeon-General of the Army, Mr. Fleming, on horses, and one of his patients was the celebrated racehorse "Ormonde." Cicatricial stenosis formed, and the horse was no better off. He did not think the human subject would be improved by the operation, as one knew so well from the experiences made in laryngeal cancer that a cicatricial band was likely to form in the situation of the removed cord. And in the event that no such band should form, the patient should be prepared for the fact that ever afterwards he would have to go without the use of his voice, and speech would be reduced to a whisper. If he were the patient himself, he would much prefer simple tracheotomy, so that he might keep his voice, though he would have to wear a tube.

Mr. MARK HOVELL said he concurred with Sir Felix Semon's remark in regard to Dr. Davis's case. The man now had such a good voice that it would be a pity to do an operation which would deprive him of it. It would be better to do tracheotomy. The inconvenience of wearing a tracheotomy tube would be less, from the wage-earning standpoint, than having one vocal cord drawn back.

Dr. WALKER DOWNIE said that some years ago he had a man with a similar condition who kept awake all the patients in the ward, and even disturbed those in neighbouring wards. The patient refused tracheotomy, and nothing could be seen with the tracheoscope. The insertion of an intubation tube overcame the noise, which was due to double abductor paralysis.

Mr. ARTHUR EVANS said he agreed with Dr. Davis that if his patient was so handicapped by difficult breathing that he could not work, then it was a reasonable procedure to remove part of the obstruction by removing one of the vocal cords; if that operation should fail, he considered that then would be the time to do a tracheotomy. Mr. Evans said that the case he himself was showing at the same meeting (see p. 114) was one in which, following an operation for removal of a tumour in the isthmus of the thyroid gland, there was paralysis of the right vocal cord. The patient's breathing was so distressful at times that she was very anxious something should be done for her relief; the thought of losing her voice, she said, was as nothing compared to the terror through which she passed during an attack of dyspnoea. It was Mr. Evans's intention to try and find the cut ends of the recurrent laryngeal nerve and suture them: if the proximal end could not be found, then to make the anastomosis with a branch of the hypoglossal loop. If this should prove impracticable, it was his intention to remove the right vocal cord.

Dr. PERMEWAN agreed with the remarks of Sir Felix Semon, especially in the case of a man earning his living by manual labour. In reference to the President's case, he was not much impressed by the argument that when such

obvious obstruction was met with in the larynx one should refrain from doing tracheotomy because there might be obstruction somewhere else. The obstruction should be removed from where it was known to exist, if only for the sake of the other patients in the ward.

Dr. PATERSON remarked that Dr. Davis's patient had had syphilis, and in syphilitic cicatrices there was danger of the condition breaking down again and leading to much greater stenosis afterwards. He counselled leaving it alone.

Dr. DAN MCKENZIE said the suggestion of removing *both* cords for abductor paralysis had already been carried out, and the chance of sufficient airway being left would be greater then, even if cicatricial tissue did form.

Dr. DAVIS, in reply, said whatever was done, the man could not have less room to breathe than he had at present, and he did not see why the cord should not be removed. The passage could be dilated periodically. He heard Professor Hobday refer to the case of the racehorse "Ormonde," but the abductor paralysis was due to a lesion further away from the cord. This man, however, had an old syphilitic perichondritis producing ankylosis of the arytenoids.

The PRESIDENT replied that he had hoped some suggestions would have been made for treatment of the mediastinal tumour. He had heard of such conditions having disappeared after treatment with X-rays and radium, and they would be tried after the difficulty had been relieved by tracheotomy.

Foreign Body retained in the Nose for Fourteen Years ; a Grain of Indian Corn, which is germinating.

By H. J. DAVIS, M.B.

THIS was expelled from the left nostril of a girl, aged 19, six weeks ago. She had been attending hospitals on and off for rhinorrhœa ever since she was aged 5. Originally she was taken to the casualty department, as "she had pushed a piece of maize up her nose instead of giving it to the canary, as she had been told to." Attempts had been made to extract the foreign body without avail. Rhinorrhœa and purulent discharge followed, and the nasal bridge sank in, almost occluding the left nostril.

The exhibitor saw her a few months ago and mistook the case for a sinusitis. Shadows equal, &c. After using drops of H_2O_2 she had violent sneezing, and in blowing her nose the foreign body exhibited was expelled. It is flattened from side to side and germinating.

The girl is now quite well and has ceased to attend the hospital.

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Dr. DAVIS added that in 1903 he showed an instance of a woman with acute rhinitis, with a profuse discharge from the nose.¹ She was asked how many handkerchiefs she used a day, and her reply was that she used twelve aprons. The foreign body which was syringed out of her nose was a small "ladybird," which had crawled up and produced the irritation. When this was expelled her symptoms subsided.

Foreign Body, a Pearl Collar-stud, impacted in the Glottis of a Child, aged 3.

By H. J. DAVIS, M.B.

LAST December the child was brought to the hospital, livid and suffocating. The Resident Medical Officer diagnosed diphtheria and



Collar-stud impacted in the glottis.

treated it as such. Tracheotomy was performed at once; the child died later. The case was not seen by the exhibitor. The stud is resting head downwards; the edges of the base lying on the cords and thereby occluding the glottis.

¹ *Proc. Laryng. Soc. Lond.*, 1903-4, xi, p. 68.

DISCUSSION.

Dr. PATERSON said that some years ago he recorded a case¹ in which a metal collar-stud was lodged in the larynx of an infant 9 months old, and remained there for three months. It lay across the larynx, and thus preserved a good airway; it was only when the breathing became difficult, owing to œdema, that the case attracted notice.

Dr. WALKER DOWNIE said that a few years ago he published a case in the *Lancet*, in which a threepenny piece was fixed in the same position for one month. The patient was hoarse, and was breathless on exertion. The foreign body had been "inhaled" while he was intoxicated.

Traumatic Injury to the Larynx in a Man, aged 41.

By H. J. DAVIS, M.B.

THE patient, a foreman in a catering house, admitted to the hospital twelve months ago under Mr. Bidwell, had cut his throat and has no recollection of the occurrence. The thyroid cartilage and tracheal rings were divided with a knife and hæmorrhage had been profuse. When seen by the exhibitor the patient was aphonic. The vocal cords were destroyed, and being replaced by granulation tissue, which has since become organized, in July, 1911, the voice returned, and it has improved steadily ever since. The left arytenoid is fixed, but the right arytenoid moves. The white semicircular band seen below the vocal cord is evidently one of the tracheal rings which is projecting inwards at the seat of injury.

Functional Aphonia in a Child, aged 6.

By H. J. DAVIS, M.B.

WHEN aged 2 the child had diphtheria and wore a tracheotomy tube for seven weeks, since which time, up to six months ago, she was aphonic and spoke only in a whisper. When first seen the larynx presented the typical appearance of functional aphonia, with bowing of the cords. Faradization with intralaryngeal electrode produced

¹ *Proc. Laryng. Soc. Lond.*, 1904-5, xii, p. 8.

immediate "return" of the voice; since, under the care of Dr. McDougal in the Electrical Department, has been treated by external faradization and tonics. The voice has since remained good.

The exhibitor thinks the case unusual in so young a patient.

DISCUSSION.

Mr. CLAYTON FOX thought it an unusual case. The question had to be considered as to whether the condition was not brought about by wearing the tracheotomy tube, or whether the diphtheria did not induce temporary paralysis.

Mr. WESTMACOTT said many so-called functional aphonias in children were really due to a reflex irritation. Aphonia often remained a considerable time after tracheotomy, even when this was done for temporary obstruction or stenosis.

Mr. CYRIL HORSFORD inclined to functional aphonia, despite the pathological history. One could imagine that the conduction of impulses from the brain had merely been in abeyance through the diphtheria, and that when the tract had recovered the carrying out of the nerve impulses had merely been forgotten, so that all that had to be done was to revive vocal memory by a stimulus.

Mr. HOVELL asked whether swabs had been taken from the throat to ascertain whether the diphtheria bacillus was still present.

Dr. DAN MCKENZIE agreed that the case was one of functional aphonia, but he would not place it in the same category with the hysterical form. The child had forgotten how to use its voice while the tube was in, and the re-learning did not occur until after the lapse of some time.

The PRESIDENT said he had had a case of functional aphonia in a younger child than this, in which diphtheria could not be invoked. The child was holding a piece of chalk in the mouth at school, when suddenly he turned blue in the face and ceased to speak, but could breathe. He was brought to hospital and examined by the direct method. He (Dr. Thomson) saw a bruise on one vocal cord, but could not see the chalk. The child was lightly anesthetized, but X-rays revealed nothing. He was put back to bed, but did not speak for a week. On the next operating day he was again put under chloroform, more deeply, and examined. He was encouraged to speak on coming round, and spoke from that time on.

Dr. DAVIS, in reply, said he did not take a swab, as the diphtheria occurred four years ago. Speech was exactly like that in a typical case of functional aphonia, and as soon as a laryngeal electrode was applied the child spoke well, but the voice then became lost again. She was sent to the electrical department for external electrical treatment, as this was more suited to a child of her age.

Case of Double Acute Frontal Sinusitis following Influenza.

By H. J. DAVIS, M.B.

Boy, aged 15, admitted four weeks ago with swelling of forehead and face. The eyelids were œdematous and the eyes closed. The case was mistaken for facial erysipelas. History of influenza ten days before, with subsequent intense frontal pain, sickness and rigors.

First operation: Large abscess in forehead evacuated. The skin undermined up to the hair; in the anterior wall of right frontal sinus was a large hole and the sinus was full of pus. Left sinus appeared not to be affected as the septum was intact. Right middle turbinal removed.

Second operation: The septum between the sinuses perforated, and the left became acutely infected ten days later, with recurrence of symptoms. Both sinuses freely laid open and a large hole drilled into each nasal fossa to enlarge the infundibulum. A complete Killian was not done as the "bridges" were destroyed. Left middle turbinal removed; the nose was not plugged; wounds healing rapidly; scars (at present) slight.

DISCUSSION.

The PRESIDENT said these cases were sometimes mistaken for erysipelas and for œdema of the eyes. He agreed with Dr. Davis that it was not necessary or advisable to do a complete Killian for acute frontal sinusitis, as was well shown in a paper by Dr. Logan Turner.

Mr. ROSE said he noticed that spontaneous perforation of the anterior wall of the frontal sinus occurred. One was commonly led to believe that it was the thin wall of the frontal sinus which gave way when the sinus was full of pus. In several of his own cases he had been struck by the fact that the thick wall of the sinus was apt to give way spontaneously. A year ago he saw a little girl, aged 16, with spontaneous perforation similar to that in Dr. Davis's case, and he wondered whether his experience was exceptional.

Dr. DUNDAS GRANT asked whether this patient was the subject of chronic frontal sinus suppuration before the attack of influenza.

Mr. HERBERT TILLEY said he did not think Mr. Rose's experience in this matter was unique. In one of the first cases of acute frontal sinus suppuration the speaker had seen, the anterior wall was of a pale greenish colour, and here the perforation had occurred.

The PRESIDENT said he had a case in which the perforation was in the anterior wall. The patient was a boy, aged 10, with acute *Micrococcus catarrhalis* infection, which began in the throat and spread up to the nose,

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and developed a fluctuating swelling under his eye. That had broken through the thickest anterior part. When it broke through the lower part it was generally an affection of the orbito-ethmoidal cell, not of the frontal sinus.

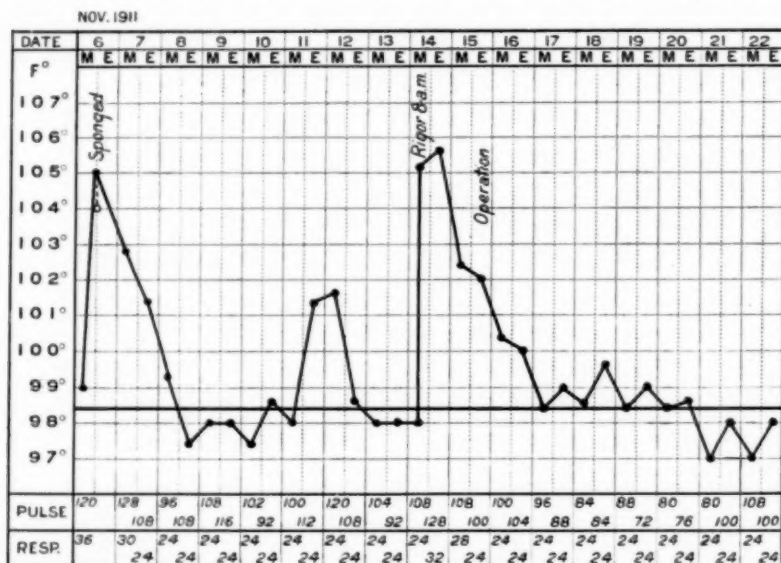
Dr. PERMEWAN said he did not know why Dr. Grant suggested long-standing disease in this case. He had opened an abscess in the posterior fossa of the skull forty-eight hours after the onset of influenza; these cases were very rapid in their course.

Dr. DAVIS, in reply, said that the case was acute; the boy was well until he had influenza. He had had to operate the same day on an old-standing case, the patient complaining of intense frontal headache, for which there was no obvious reason. He laid open the almost obliterated sinus, and found there was erosion of the posterior wall and an abscess of the frontal lobe. This burst, and he had basic meningitis, to which he succumbed. He thought the pain from which he had suffered for four or five years had been from abscess of the frontal lobe, which might have been there all the time.

Case of Acute Sphenoidal and Maxillary Sinusitis.

By H. J. DAVIS, M.B.

THE patient, a ward-maid, aged 21, was admitted last November under Dr. Seymour Taylor; she had rigors and was extremely ill, with



Temperature chart of case of acute sphenoidal and maxillary sinusitis.

nothing to account for it. She complained of no nasal trouble, but a transilluminator showed marked opacity on the left side. She was transferred, and the maxillary ethmoid and sphenoid were at once opened and drained; they were full of pus.

The alteration in the character of the charts after operation is interesting.

DISCUSSION.

The PRESIDENT noted that the patient did not complain of nasal trouble, and one should not refuse a rhinological inspection because there seemed to be no pus. The patient might indignantly deny that there was pus, and yet the sinuses might be found occupied. He asked whether the sinuses were opened on both sides, and whether the operations were exploratory, or whether enough pus was found in the nose to locate it to its sources. He presumed the clinical symptoms were rigors and malaise only, and that there were no localizing symptoms in the head and eyes.

Dr. DAVIS replied that the woman was very ill, and nothing was seen to account for this; Dr. Seymour Taylor could not find anything in the lungs or abdomen to give a clue. She said she had had no discharge or pain. When transilluminated she had a marked shadow, and as the X-rays also showed a shadow, he opened the antrum and sphenoid and curetted the ethmoid cells. After this the temperature fell, and she was now well. He had found that the cases in which he was told there was no optic neuritis often turned out more serious than the others, and he therefore was not much influenced by its absence.

The PRESIDENT related the case of an officer at Aldershot who had come from the East, and for three weeks had had a temperature. A specialist in tropical diseases saw him, as it was thought it must be an Oriental disease, but it was not. The late Sir William Broadbent said he thought it was syphilis, but it was not. The leading chest specialist of that time said that though there were no chest signs, he felt sure it would turn out to be tuberculosis, but it did not. Then a leading fever specialist from London came and said it was a fever, but he did not know what kind! Meantime the patient continued smoking cigarettes and walking about. He (Dr. Thomson) finally saw the patient, let out some pus from the ethmoid and sphenoid, and the temperature dropped at once.

Lupus of Hard and Soft Palate, Epiglottitis, Larynx, and both Nasal Cavities ; Lupus Erythematosus on both Cheeks.

By H. J. DAVIS, M.B.

GIRL, aged 16 ; disease originated two and a half years ago ; treated at Great Ormond Street and University College Hospitals (under Mr. Tilley) with tuberculin. Came to West London Hospital lately. Disease advancing on palate but receding elsewhere. General health good ; patient plump and no pain. Temperature normal.

Mr. HERBERT TILLEY said that when the patient was in University College Hospital she had a big ulcer on the hard and soft palate, and it was, under general anaesthesia, scraped, and pure lactic acid was rubbed in. It almost entirely healed, but to-day it had obviously broken out into a larger ulcer. The patient had had many injections of tuberculin, and as she had moved to Hammersmith it was more convenient for her to be under Dr. Davis's care than to attend the University College Hospital, where she was first seen by the speaker.

A Case of Tracheotomy performed Sixteen Years ago for Fixation of Cords in Mid-line, caused by (?) Inflammation of each Crico-arytænoid Joint.

By HERBERT TILLEY, F.R.C.S.

THE patient, a man, aged 59, had a good voice. It was not now necessary to put his finger over the tube when he wished to speak. The case proved the value of tracheotomy, as opposed to removal of a vocal cord.

DISCUSSION.

Mr. TILLEY added that he once removed a vocal cord in such a case as Dr. Davis's, and tracheotomy had eventually to be done. The patient now exhibited came into hospital with acute sore throat and laryngitis of ten days' duration, but the dyspnoea was so extreme that tracheotomy was performed at once and he had remained well ever since. The fixation of the cords must have been due to a local inflammation of both crico-arytænoid joints. He also cited a case of the same kind on whom he operated two years earlier, and this man also was still alive and active.

The PRESIDENT referred to the well-known porter of former days at the Golden Square Throat Hospital, who wore a tracheotomy tube for twenty-five years. He led a very active life, and used to carry patients down stairs from the operating theatre.

A Case of Extensive and Rapid Destruction of the Soft Palate by Specific Disease.

By W. JOBSON HORNE, M.D.

THE patient, a woman, aged 28, was sent to hospital on February 7, 1912, and reported herself to have been well up to three months previously. Since then the throat had been sore, and the voice had become affected. The throat presented on February 7 extensive perforation and destruction of the soft palate extending to the free border, and active ulceration which had involved the posterior wall of the nasal and oral pharynx. The power of distinct articulation was lost. The nasal passages were partially obstructed by what appeared to be gummatous infiltration of the septum, which was a little deflected.

The case illustrates the insidiousness and the rapidity of the ravages to the soft palate by gummatous infiltration. Of course this is explained by the fact that the infiltration usually commences on the posterior side of the soft palate, and has been smouldering for some time before it breaks out by a perforation in front. The patient for a while not uncommonly attaches little importance to the symptoms to which it gives rise, and regards the condition as due to an ordinary nasal catarrh. The case further illustrates the fact that a routine practice of posterior rhinoscopy in cases of "post-nasal catarrh" when they first come under notice would be the means of preventing the destruction of the palate.

DISCUSSION.

Mr. MARK HOVELL said he thought that in the cases of rapid syphilitic ulceration the use of opium locally and internally was sometimes forgotten.

The PRESIDENT said three months was slow for syphilitic destruction; much damage could be done by the disease in a week or ten days. It was in such cases that salvarsan was useful.

Growth from the Trachea in a Woman, aged 24.

By W. H. KELSON, M.D.

PATIENT is a married woman with no history of tubercle or syphilis. She states that difficulty in breathing commenced a year ago, and it became noisy three months ago, getting gradually worse. On examination at hospital it was found that the larynx was normal. At about 1 in. below the level of the cricoid cartilage and taking origin posteriorly from the tracheal wall a growth was seen. There was marked stridor, but no expectoration. No enlarged glands. Many rhonchi and other abnormal sounds were heard in the upper part of the chest, so that the house surgeon suspected phthisis. With the assistance of Dr. William Hill (to whom I am indebted) the growth was removed by the direct method without tracheotomy under a general anæsthetic, with immediate relief to the breathing and disappearance of the chest sounds. It appears to be a papilloma.

DISCUSSION.

Dr. DUNDAS GRANT said he had a case of multiple papillomata of the larynx in a child, in whom the dyspnoea was so pronounced that he had to perform tracheotomy. After the opening of the trachea, however, the child did not breathe much better, but after some struggling and the removal of the tube, the child gave a violent cough and expelled a papilloma of considerable size, which had evidently been growing from the trachea. Breathing was then quite easy. No recurrence took place.

Dr. KELSON, in reply, said that to the naked eye it seemed to be a papilloma, but on looking up the history of such cases it occurred to him it might be something else, such as an aberrant thyroid. He hoped to show a section of it at the next meeting.

Cystic Condition of Left Arytænoid in a Tuberculous Subject.

By ANDREW WYLIE, M.D.

C. W., BOY, aged 7, attended hospital for the first time last week complaining of pain on swallowing, six days' duration. The patient was sent to the hospital to have his tonsils and adenoids removed. For several years the cervical glands have been enlarged, but lately have become painful. Profuse sweating at night and loss of weight. Crepitant

râles are present at the base of the right lung, but no expectoration. No tuberculin tests have been made.

Cicatricial marks are seen on the pharynx and nasopharynx, due to an operation three years ago. On laryngoscopic examination of the larynx a large, glistening, cystic swelling is seen covering the left arytaenoid and part of the left vocal cord. The vocal cords are otherwise normal, and there is no sign of infiltration in any other part of the larynx. Whether this is a simple cyst or a tuberculous pseudo-œdema of the left arytaenoid, it is a condition rarely seen in children.

Syphilitic Ulceration at the Base of the Tongue.

By ANDREW WYLIE, M.D.

MALE, aged 35, barman, but formerly a sailor, attended hospital last week complaining of a slight difficulty in speaking. On examination, the epiglottis was swollen. At the base of the tongue there is considerable ulceration, of a deep, crater-like character. The patient felt the tongue stiff three months ago, but there has been no difficulty in protruding it. On palpation there is no hardness. A slight improvement has taken place under ten days' treatment with potassium iodide. There is a history of specific disease.

DISCUSSION.

Dr. H. J. DAVIS said he thought it was malignant.

Dr. WYLIE, in reply, said the patient had been under his observation ten days. There was a history of syphilis. The ulcer had improved considerably under iodide of potassium. He had little doubt that it was a specific ulceration.

Severe Epistaxis associated with Multiple Hereditary Telangiectases.

By GEORGE WILKINSON, F.R.C.S.

MR. W. F., aged 62, had suffered for several years from severe nose-bleedings. He was blanched, and very weak; the face and front of the neck showed multiple telangiectases. About fifteen distinct raised red spots could be counted, and the small blood-vessels of the skin were conspicuously dilated. There was a well-marked spot on the lower lip,

and several bright red spots on the roof of the mouth and tongue. No spots on the body or limbs.

He gave the following history: He first noticed the spots about thirty years ago, and about then he began to have nose-bleedings from time to time. The hæmorrhage, however, had only been severe during the last two or three years. One month before seeing the reporter he vomited a large quantity of blood. He then consulted Dr. Burgess, (Sheffield) who recognized that the source of the blood was the nose, and that the condition was multiple hereditary telangiectases (as described by Sir William Osler).¹ Family history: The father died at the age of 83. He had been for many years the subject of bright red spots on the face and lips, and of bleeding from the nose. The bleedings were less severe as he grew older. A younger brother of the patient, who died from the effects of an accident when aged 35, also presented spots on the face, and occasional nose-bleedings. None of the other four brothers and three sisters, or their children, have shown signs of the condition. He has a son, aged 37, who is quite free, and a married daughter. The latter occasionally bleeds from the nose, but shows no spots. She has four children, the eldest aged 10, none of whom show any sign.

Nasal condition (October 16, 1911): On examining the interior of nose Kiesselbach's area on either side of the septum was seen to be covered by a number of dilated prominent venules, from which there were signs of hæmorrhage having recently taken place. They bled readily when touched with a probe. The areas were treated with the galvano-cautery, after application of adrenalin and cocaine. He was seen a month later, and had improved very much in health. There was still some bleeding. Some of the vessels on the septum had escaped treatment with the cautery owing to their having become invisible after the application of adrenalin. They were touched with the cautery point without previous cocainization. He was again seen on January 24. He had completely recovered his health and colour. There had been one or two bleedings during the previous week from the right nostril. Careful examination revealed a small vascular spot high up on the outer wall just beyond the limit of the vestibule. This was treated with the cautery. Since then he has remained free.

MR. WILKINSON, in answer to the President, said that chloride of calcium had been given, but he thought the recovery was due to obliteration of the vascular areas in the nose by the cautery. Several such cases had been shown before the Section.

¹ *Quart. Journ. Med., Oxf.*, 1907-8, i, pp. 53-58.

(?) Papilloma removed from the Posterior End of the Right
Inferior Turbinal.

By GEORGE WILKINSON, F.R.C.S.

THE patient was a man, aged 47, who complained of absolute stoppage of the nose for four years. Owing to extreme congestion and swelling of the mucous membrane of the nose, and abundance of mucous secretion, it was only after packing the nose with adrenalin and cocaine that any view could be obtained. Papillary masses filled both choanæ. Those on the left side were removed by repeated applications of the snare. The condition on this side was ordinary papillary hypertrophy. The snare wire could not be passed round the mass at the back of the right nostril. With the finger one could feel that the right half of the nasopharynx was filled with a firm papillary mass. Under general anæsthesia the attachment of this mass was divided from the back of the inferior turbinal by scissors. The mass measures 4 cm. by $2\frac{1}{2}$ cm. by 2 cm. The pedicle measures only 3 mm. in diameter. Microscopically, the core of the mass is fibrous, and with a large number of blood-vessels. It is covered with palisade epithelium, which varies much in thickness in different parts of the section. The projecting portions of the papillæ have a single layer of epithelial cells only. The subepithelial layer contains numerous (? lymph) spaces, and shows considerable proliferation of endothelial cells.

DISCUSSION.

Dr. PEGLER said he knew of no such specimen ever having been before the Society, and as the exhibitor had kindly allowed him to see the specimen and microscopic section some days before the meeting, he was able to say that he could find no description of a case like it in the published treatises or atlases of rhinology. He thought it was hopeless to decide the question between inflammatory growth and pure neoplasm here, but the history of several papillary hypertrophies having been snared from the adjoining fossa indicated that the large growth projecting into the nasopharynx was of the same essential character—e.g., a sort of giant posterior moriform hypertrophy of the inferior turbinal. Also, except for the fact that it contained *no glands*, the microscopic structure showed no intimate departure from that of other papilliform bodies that the speaker had hitherto examined from the floor of the meatus

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or the inferior turbinal. There were all the familiar features of these growths, but on a very large scale—e.g., an exaggeration of seaweed-like arborescence and sinuosities of the surface, a coarseness of the fibrous stroma, a multiplication of endothelioid cells, and an enlargement of the spaces that were too often taken to be lymph spaces in the subepithelial area; but an analogous hypertrophy very rarely overtook the lymphoid nodules so often seen near the free border of the septum when these bodies grew out into large pedunculated masses. The speaker had shown such an example to the old Society many years ago.¹ The pedicle in Mr. Wilkinson's case had developed with the general growth of the unsupported body. Ordinary papillary and moriform hypertrophies were not pedunculated, but this fact would scarcely warrant our naming this specimen a papilloma. In the present state of our nomenclature we had to avoid confusion with the true wart or squamous papilloma.

Mr. WILKINSON replied that the question as to whether the tumour was an inflammatory product or a new growth was one he felt himself incompetent to decide. Since the rejection of Hopmann's views as to the pathology of papillary hypertrophy of the inferior turbinal, pathologists seemed to have been rather sceptical as to the existence of soft (as distinguished from horny) papilloma in the nose at all. The tumour was not sessile, but very distinctly pedunculated. It measured 4 cm. by 2.5 cm., with a pedicle only 3 mm. thick. In any other situation, such as the rectum, the mass would be regarded as a papilloma. If it were acknowledged that a papilloma could grow from the posterior part of the inferior turbinal, one would expect it to be covered (as was the specimen) with cylindrical rather than squamous epithelium. He suggested that the papillary hypertrophy on the other side of the nose might be secondary to obstruction caused by the mass at the back of the nose, which would produce congestion and stagnation of secretions. References to such a case as that shown were scanty in the text-books, but Kyle mentions papilloma of the nasopharynx growing from the back of the inferior turbinal, as being rare, and as distinct from papillary hypertrophy. In the *Centralblatt* for June, 1905, four cases were recorded as occurring in America. He had not made sections of the other side. In answer to the President's suggestion he agreed to the case being referred to the Morbid Growths Committee.

¹ *Proc. Laryng. Soc. Lond.*, 1897-8, v, p. 16.

**Molar Tooth removed from Right Bronchus by Upper
Bronchoscopy.**

By GEORGE WILKINSON, F.R.C.S.

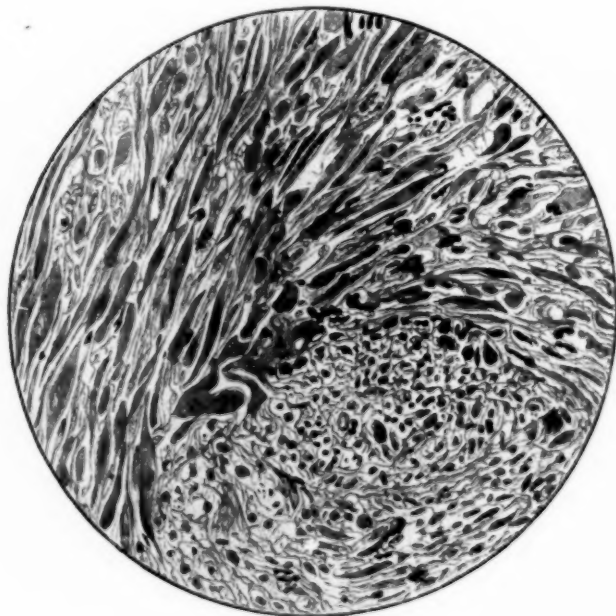
THE patient, a youth, aged 17, was brought to the reporter direct from the dentist's in whose consulting room the accident had occurred. The left lower wisdom-tooth was being extracted under gas when he began to come round and struggle. The tooth was knocked out of the grasp of the forceps into the throat, and disappeared. He complained of some pain in the right side of the chest. On examination, breath-sounds were completely absent from all parts of the right lung. The skiagraph showed the shadow of the tooth anteriorly opposite the second intercostal space, $\frac{1}{2}$ in. from the sternum. Upper bronchoscopy was performed with the patient under chloroform, in the left lateral position. The tooth was seen to be lying obliquely, crown upwards, in the right bronchus, the roots being in the entrance of the upper (eparterial) lateral branch. It was too large to be brought through the (9 mm.) tube. At the first attempt at extraction it was dislodged from the grip of the forceps when the glottis was reached, and fell back into the lower part of the trachea. At the second attempt it was brought into the mouth, where it was secured by the house surgeon. The patient made an uninterrupted recovery.

The PRESIDENT said there was difficulty in bringing such bodies through the Killian tube, as they often hitched against the end of the barrel and got knocked off. It was better to remove foreign body and tube all in one.

Microscopical Section of Melano-sarcoma of the Nose.

By GEORGE WILKINSON, F.R.C.S.

THE section was taken from the tumour shown at the November meeting of the Section,¹ and was kindly prepared for the exhibitor by Dr. Hemington Pegler, whose description of the slide is appended.



Microscopical section of melano-sarcoma of the nose. The drawing shows a section through the spindle-cell bundles of the sarcoma, longitudinal in the upper part and transverse in the lower. The entire growth consisted of an interlacement of such bundles. The melanin granules, which in the stained section show up as particles of a golden-brown colour, are seen scattered about the field in small masses—some intracellular and some free in the ground substance. ($\times 220$.)

¹ See *Proceedings*, p. 11.

Lantern Demonstration of X-ray Photographs illustrating Diseases of the Accessory Sinuses.

By W. IRNSIDE BRUCE, M.D.

IN the X-ray examination of the bones of the face, the sinuses are demonstrable in virtue of the air they contain. The only mechanical difficulty we have in securing satisfactory shadows is to avoid the great density of the occiput. This we accomplish by projecting the radiation through the skull, above the occiput, and in the recumbent position in which these shadows are secured; we place the head well inclined backwards, the forehead making an angle of about 30° in the horizontal. The X-ray tube is then arranged symmetrically behind the head in a position exactly corresponding to the nasal process of the frontal bone. Under these circumstances the skiagraph obtained is as in the slide I show you. Should the sinuses contain fluid, their opacity is undoubtedly obscured, for fluid is dense to X-ray, as you will see in the next slide. Here we have the shadow of two square boxes, one containing air, the other water. You will notice that the water has obstructed the passage of the X-ray, and, on development, the corresponding part of the plate is lighter in appearance. In this case, it is the negative that I have shown you, but lantern slides are positives, and the area corresponding to the fluid is darker in appearance. When fluid is present in a frontal sinus, the same effect is produced, so far as the plate is concerned, and in the next slide one frontal sinus is distinctly darker than the other, because it contained a fluid, a fact that was proved by operation.

DISCUSSION.

Dr. H. J. DAVIS thought a case of acute coryza would present difficulties, as there was sure to be fluid in the sinuses in such a case. And if there were fluid in the antra and it was clear, there would be very little alteration in the degree of translucency on both sides. On the previous day he saw a nurse at the hospital with acute frontal sinus trouble commencing, and she had been in intense pain. He sent her to the X-ray department, and the report was that the appearances were normal. Notwithstanding that, he thought it was certain she had pus in the frontal sinus.¹

¹ March 15: This case subsided without any operation; cocaine, adrenalin and menthol vapour were employed for opening up the infundibulum and the sinus drained; pus escaped and suppuration was arrested.

Dr. FITZGERALD POWELL said that in the case of fluid, such as hydrops, or antral cysts, the translucency was very much increased, and showed more brightly than on the normal side.

Dr. IRONSIDE BRUCE, in reply, said he did not think there would be any difference in the opacity of sinuses filled with fluid compared with that when they were full of pus. There were some bone changes he had heard Dr. Hill refer to, particularly in connexion with acute conditions of the sinuses; by X-ray examination it was possible to recognize changes in the frontal bones, which would indicate that the accumulation was not fluid, but pus. In the case he had shown of acute frontal sinus trouble, there were bony changes to be observed, and the presence of such changes combined with the clinical facts made a correct diagnosis possible.

Paralysis of the Right Vocal Cord following Injury to the Recurrent Laryngeal Nerve.

By ARTHUR EVANS, M.S.

M. W., a FEMALE, aged 50, was operated upon in May, 1910, for a rapidly growing fibro-adenoma in the isthmus and right lobe of the thyroid gland. Previous to the operation, she had complained of "pains in the chest and a feeling of suffocation"; these symptoms were worse at nights. When I saw the patient in June, 1910, there was complete paralysis of the right vocal cord, and this condition has persisted. Since that time she has had bad attacks of difficult breathing; these attacks have recently become more frequent and more severe; they now last fifteen or twenty minutes, and occasion great distress; the patient says she feels as though she "must choke."

The PRESIDENT said it would be interesting to know whether the paralysis came on at once, or only after a time. It was not always that the surgeon could be blamed for it, as the nerve might become fixed in the contraction of the scar.

(See discussion, p. 96).

Case of Vincent's Angina.

By GEORGE W. BADGEROW, F.R.C.S.Ed.

THE patient, a boy, aged 5, attended the Throat Hospital on Monday, February 19. His mother said he was fretty and feverish three or four days before, and complained of something wrong in his throat. On examination, a deep punched-out ulcer, with a sloughy base, appeared

on the left tonsil, the glands were swollen in the neck on both sides, and he had a temperature of 99° F. A swab was taken, and a culture was made by Mr. H. D. Gillies, the fusiform bacillus and spirillum being found.

Present condition : Depression in left tonsil, no slough or membrane.

Case of Herpes of the Palate.

By C. W. M. HOPE, F.R.C.S.

THE patient complains of sore throat, which started on the left side four days ago, causing pain on swallowing. Has had several attacks of herpes on body and limbs during last three years. Last attack six months ago.

Present condition : Vesicles on right half of palate and pillars ; one at base of uvula. On left side vesicles have run together, ruptured, and now show as aphthous patches. Had pain till mid-day to-day, none now. Glands enlarged on both sides of the neck.

The PRESIDENT said that although one saw aphthous-like patches left it was very rare to see the vesicles. Generally in his cases the vesicles had collapsed and there was only the aphthous patch visible when patient reached the meeting.

Gumma of the Thyroid Cartilage.

By F. F. MUECKE, F.R.C.S.

PATIENT first noticed swelling three months ago, which fairly rapidly increased so as even to interfere with swallowing. Began to lose the voice at the same time. Large semi-cystic swelling over the thyroid cartilage, and exactly following the outlines of the right wing. The right side of the larynx is swollen and ulcerated, the right cord red and ulcerated. Numerous other signs of specific disease are evident. Under anti-specific treatment the growth has diminished rapidly.

? Dental Cysts inside the Nose.

By F. F. MUECKE, F.R.C.S.

THE cysts project into the sides of the nares, and push forward the bases of the alæ nasi. Both first bicuspid are defective.

DISCUSSION.

Mr. CLAYTON FOX said that on examining the nose he found the swellings were soft and collapsible. There was no evidence of dental cyst, which was usually solid and produced egg-shell crackling on palpation. The anterior ends of the inferior turbinated bodies had been removed and what remained appeared to be cavernous tissue with some scar tissue.

Dr. FITZGERALD POWELL considered it was cyst in the floor of the nose and he felt distinct fluctuation. It appeared to be bilateral or extending into both nostrils.

The PRESIDENT said he thought that on the right side there was a cyst of the floor of the nose. It had generally been agreed that they were almost exclusively of dental origin.

Tumour of the Larynx—Case for Diagnosis.

By F. F. MUECKE, F.R.C.S.

AN ulcerating swelling on the left side of the larynx, involving the cord, ventricle and arytaenoid. Movement fair. Hoarseness five months. No specific history. No signs in chest. No tubercle bacillus found in sputum. No pain.

The PRESIDENT considered it a case of specific disease with probably superadded tuberculous infection.

Epithelioma of the Larynx.

By WALKER DOWNIE, M.B.

MARRIED woman, aged 40. Complained of sore throat for three months (March till June). Every time she swallowed she had sharp pains shooting up to the right ear. There was an accumulation of mucus in her throat at all times, and she had much discomfort and trouble in trying to remove it. There was a large hard mass extending downwards from the angle of the lower jaw on the right side; it was deep-seated, firm and fixed. Laryngoscopic examination revealed great swelling of the right arytaenoid, with ulceration on its upper and laryngeal aspect; the right ventricular band was also so much swollen as to overlap and wholly cover the right vocal cord. There was œdema of the left arytaenoid and ary-epiglottic fold. From the extent and position of the primary disease, the deep and extensive implication of the lymphatics, &c., I advised against operation, as I was of opinion

that it could not be wholly removed. A consultation was arranged with one of our most able surgeons, and he thought the removal of the affected parts possible. He removed the tumour in the neck, ligaturing the carotid and the jugular, excised the larynx and the upper part of the œsophagus. The patient did well for three days, then symptoms of cerebral degeneration ensued, and the patient died.

Microscopical Sections from a Case of Tuberculous Ulcer of the Larynx; the First suggestive of Epithelioma, the Second of Non-bacillary Tuberculosis. ? Lupus.

By J. DUNDAS GRANT, M.D.

The case was shown at the meeting of the Section on November 3, 1911.¹

Pathologist's Report.—"Section of fragment from larynx removed on October 30, reported as very suspicious, the epithelium very greatly thickened, irregular in size, shape, and grouping. It shows a great tendency to spread inwards and to form 'pearls.' There is also considerable lymphocytic infiltration. It may be granulomatous, but the epithelial activity is so marked that it is strongly suggestive of early malignancy. Section of fragment removed on November 29, reported as a typical tuberculoma. Giant cells and epithelial infiltration are unmistakable. Stained for *Bacillus tuberculosis* with negative results. There are no signs of caseation, while there are very few of fibrosis. Consequently, in the absence of *Bacillus tuberculosis*, it should be lupus."

Intrinsic Carcinoma of Larynx removed under Infusion Anæsthesia with Hedonal.

By WALTER HOWARTH, F.R.C.S.

THIS case is shown to bring forward the great advantages that this method of anæsthesia affords in this class of case. The anæsthetist is removed from the field of operation, there is no tendency to spasmodic cough and straining as is often the case when the trachea is opened and chloroform vapour pumped directly on to the mucous membrane of the trachea. There is certainly less bleeding and tendency to ooze, but

¹ Vide *Proceedings*, p. 29.

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this is probably dependent on the complete relaxation and immobility that is obtained. Owing to these advantages the time required for the operation can be much reduced and shock in consequence diminished. The tumour removed in the present case was an epithelioma involving the whole of the left vocal cord. The tracheal wound, as well as that in the thyroid cartilage, was closed at the end of the operation, which was performed six weeks ago.

DISCUSSION.

The PRESIDENT congratulated Mr. Howarth, because the new cicatricial vocal cord was already well formed. Laryngo-fissure was an excellent occasion for using the intravenous method of anæsthesia.

Mr. HOWARTH, in reply, said that hedonal was a urethane derivative, and was allied to veronal. It had been used with much success in Germany, and had been employed in about a hundred cases at St. Thomas's Hospital. He had operated in about a dozen of these cases and had always been most pleased with the anæsthesia. He thought that it could be considered a safe anæsthetic and would certainly always use it in cases like the present one.

Tuberculous Ulceration of the Pharynx and Larynx.

By WALTER HOWARTH, F.R.C.S.

THE patient came to hospital complaining of pain on swallowing. The posterior wall of the pharynx is markedly ulcerated and the left side of the epiglottis and epiglottic fold and left arytaenoid are infiltrated and swollen. There are no signs in the lungs.

The PRESIDENT suggested that the exhibitor should apply the term "lupus" to it, as clinically it was distinct from tuberculosis, although there was the same pathological foundation for both. Tuberculosis of the larynx to the extent this woman had it would have prevented her swallowing and talking and looking as happy as she did.

Cystic Swelling of the Nose.

By WALTER HOWARTH, F.R.C.S.

THE patient has noticed the tip of his nose becoming larger for the past few years, but says that the condition has been present since birth. The end of the nose is rather bulbous in appearance and is uniformly distended by an elastic, fluctuating swelling. The skin is not involved. The patient is very anxious to have some form of operative treatment.

Laryngological Section.

March 29, 1912.

Dr. STCLAIR THOMSON, President of the Section, in the Chair.

Demonstration of Osteoplastic Radical Frontal Sinus Operation on the Dead Body.

By P. WATSON-WILLIAMS, M.D.

(1) FIRST skin incision from the outer orbital angle along the upper margin of the eyebrow and curving downwards till it reaches a point at the side of the nose corresponding with the most receding portion of the fronto-nasal junction, and thence the incision is carried transversely across this most receding line. The skin and soft tissues above the incision are raised, leaving the periosteum intact.

(2) The periosteum is divided by a transverse curved line corresponding to the upper portion of the frontal eminence, and above this line the periosteum is raised, the frontal sinus exposed by chisel or trephine, and the whole of the anterior wall is removed above the curved line, which corresponds to the upper margin of Killian's bracelet. The sinus is denuded of mucous membrane, and the fronto-nasal duct is enlarged by a narrow chisel, so that a large smooth-walled fronto-nasal opening is formed.

(3) Second skin incision from a point about $\frac{1}{2}$ in. below the inner canthus and extending for $\frac{1}{2}$ in. or more outwards and slightly downwards, corresponding with the lower margin of the lachrymal groove. A chisel or periosteal elevator is made to enter the lachrymal groove below and to the inner side of the duct which is thereby turned safely out of the groove. Then a narrow chisel or cutting forceps is driven right into the nasal passage through the thin bone at the bottom of the lachrymal groove. This bone opening into the nasal passage is enlarged

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downwards and inwards so as to partially divide the nasal process of the superior maxillary bone.

(4) A curved saw is passed up through the naris till its tip projects out of the enlarged lachrymal groove opening, and the nasal process of the superior maxillary bone is then divided from within outwards, the superficial soft tissues being left intact. Then the bone above the



Diagram of the osteoplastic frontal sinus operation, illustrating the method of forming the osteoplastic flap after the frontal sinus has been opened. 1, the nasal process of superior maxillary bone being divided subcutaneously by the saw passed in through the nose so as to emerge at the opening in the lachrymal groove; 2, a Gigli saw, passed from above down the enlarged fronto-nasal duct so as to emerge at the lachrymal groove opening to divide the bone subcutaneously; 3, the osteoplastic flap which then results on the vertical division, by knife and saw, of the skin and bone near the mid-line, and which is then turned outwards like a doorway on a hinge; 4, the facial artery running up to 3, where it becomes the angular artery. As it courses inwards below the bony margin where the saw divides the nasal process, the artery is not injured, and the preserved vascular supply of the osteoplastic flap ensures its vitality and the rapid reunion of its cut edges.

lachrymal groove is divided from within outwards by means of a Gigli saw passed down through the enlarged fronto-nasal passage so as to emerge at the large opening in the bottom of the lachrymal groove.

(The passing of the Gigli saw is a simple procedure if the author's flexible copper frontal sinus probe with a hooked end is passed down the fronto-nasal duct, so that the hooked end projects at the lachrymal groove, when the Gigli saw is hooked on and drawn up as the probe is withdrawn.) The bone is divided from within outwards, leaving the superficial soft tissues intact. In this way the hinge of the osteoplastic "door" has been made, and it only remains to divide the bone and soft tissues in the mesial line to form the doorway.

(5) Final incision. A longitudinal mesial incision extends from the centre of the transverse incision across the root of the nose downwards as far as the lower free margin of the nasal bone, the periosteum not being divided. The soft tissues are raised for about $\frac{1}{4}$ in. from the mesial line. Finally, by again passing the Gigli saw through the fronto-nasal duct down the nasal passage till it emerges below the nasal bone, just outside the margin of the septum nasi, the bone is divided longitudinally. The osteoplastic flap thus formed is carefully opened outwards like a doorway, the soft tissues left undivided by the former saw-cuts acting as a hinge. The nasal passage and the whole length of the fronto-nasal duct are in this way laid freely open to view. The anterior end of the middle turbinal and all the diseased ethmoidal cells are cleared away, if desirable, right back to the sphenoidal sinus, which may also be freely opened. When the frontal sinus floor and ethmoidal cells have been removed and the whole of the diseased area removed, the osteoplastic flap is carefully replaced and the skin incisions sutured.

If both frontal sinuses have to be opened, the first incision may have to be extended to the other side. But I now avoid making a second flap by removing not only the frontal sinus septum but also the corresponding upper portion of the bony septum nasi, thus throwing the denuded frontal sinuses and the upper portion of the nasal passages anteriorly into one cavity.

DISCUSSION.

The PRESIDENT (Dr. StClair Thomson) said the Section was much obliged to Dr. Watson-Williams for his excellent demonstration, thus making clear a matter which was so difficult to describe. The thanks were due all the more as Dr. Watson-Williams was a provincial member, and had not the instruments and accessories close at hand here.

Mr. WAGGETT said he had seen Dr. Watson-Williams do the operation a year ago and was much struck with the admirable view it gave of the whole of the nose. It was an excellent piece of work, and he could make no criticism

of it except a theoretical one—namely, the danger of losing the osteoplastic flap by necrosis. This was a question to be answered by results, and it would be interesting if Dr. Watson-Williams would say what his results had been. The scars which he had seen in two or three patients had been excellent.

Mr. HERBERT TILLEY said he was glad to have seen the present operation, because for pansinusitis it seemed ideal, though he did not know that one could say so much for it when the frontal sinus and a few anterior ethmoidal cells were involved in suppuration. With a combination operation on the basis of Killian's method, excellent results could be obtained with a less extensive procedure than Dr. Watson-Williams's operation, and the occasion had not yet arisen with him (the speaker) when the larger operation was called for. The diseased ethmoidal cells could very well be removed through the nostril. If the orbito-ethmoidal cells extended outwards to the temporal fossa, did Dr. Watson-Williams find his operation made those cells as easy of access as by the Killian operation? It was very easy to remove the roof of the orbit by the Killian operation, especially when the ethmoidal cells extended there. It was comparatively easy to cure suppuration in the frontal sinus, but not so easy to check it when the ethmoidal cells were involved. The whole secret of the frontal sinus operation was to remove the adjacent and diseased ethmoidal cells.

Dr. WATSON-WILLIAMS, in reply, said that although by the Killian operation one got at these cells and removed the orbital roof, and he had done that operation a number of times, he found his own method easier in a considerable proportion of cases. But cases varied very much. He never performed a radical operation upon the frontal sinus cases unless the conditions obliged him to; but when radical operation was called for, he thought it was best to make it as radical and thorough as possible. Removal of the inner orbital wall or not depended on removal of the orbital roof. If the floor of the frontal sinus was removed, the inner orbital wall must be removed at the same time. The operation he had just demonstrated made it easier to get at the ethmoidal cells in connexion with the frontal sinus—those which ran out towards the orbit. The case which Mr. Waggett saw him operate upon at Bristol was one of the most extensive they had had there; it extended to the right external orbital angle on both sides, and upwards nearly to where the hair began on the forehead. He showed the case at the Bristol meeting of this Session. The patient completely recovered, with very little scarring considering the extent of the operation. He had not had cases where there was necrosis of the flap, and an important point was that by this operation one was able to preserve the facial artery to the top of the flap. It was because he had had two cases of necrosis of the bridge in Killian operations that he felt he would like to devise another procedure. With a narrow bridge there was greater liability to necrosis, whereas with a broad bridge it was difficult to get at the ethmoidal cells. In his own method, however, there was less chance of necrosis, and the exposure was so much better that once the flap had been turned out the operation could be more freely and safely and successfully completed.

New Electric Light Gag for use in Operating on the Fauical Regions, &c.

By P. WATSON-WILLIAMS, M.D.

A SMALL 3-volt metallic lamp carried on a stem fixed to a Doyen gag gave a good illumination of the fauces, tonsils, &c., and, being high up behind the upper tooth-plate of the gag when in situ, it was out of the line of vision.

Large Cyst in the Right Tonsil of a Woman, aged 24.

By H. J. DAVIS, M.B.

THE cyst is as large as a pigeon's egg. It is transparent, and in colour deep yellow. There are dilated venules coursing over the surface. "It commenced growing two years ago"; it is now producing some dysphagia. It is possible that the tonsil contains a calculus.

Dr. DAVIS added that the cyst burst after a singing lesson and there was little to be seen at the moment, but it was now slowly refilling.

Foreign Body, a Nail Two Inches long, in the Left Bronchus of a Child, aged 2½, with Complete Transposition of Viscera.

By H. J. DAVIS, M.B.

THE child had been ill six months, and was nursed at home until a short time before its death, when it was admitted to the West London Hospital under the care of my colleague, Dr. Seymour Taylor. He never saw the case, the child dying shortly after admission, in great distress, with physical signs pointing to empyema and gangrene of the left lung. An X-ray photograph was taken with difficulty owing to the child's restlessness, in order to see if there was pus in the pleura, and this was explored; it was also noticed that the viscera were transposed.

At the post-mortem a nail 2 in. long was found lying in the bronchus, and this can be observed on the X-ray plate exhibited, the nail lying head downwards in the left bronchus, but, unfortunately, attention was not directed to this until too late, the child dying of septic pneumonia and gangrene of the left lung with a temperature of 105° F.

The case is also interesting from the fact that the nail fell into the *left* bronchus. It is well known that for anatomical reasons the right bronchus is the one into which a foreign body is more likely to drop, but in this case, owing to the complete transposition of viscera, the *left* bronchus is practically the *right* bronchus, its lung having three lobes instead of two, and the aorta hooking over the right bronchus instead of the left.

The case also calls attention to the fact that in children unilateral lung disease should always suggest the possibility of a foreign body being the origin of the trouble, just as a unilateral nasal discharge should do. On the Continent many of these cases are examined as a routine by the bronchoscope with this object in view, and a well-known authority has stated that if this were systematically done, foreign bodies would be found in the bronchi of children far more frequently than is generally supposed. The importance of this is obvious.

The following specimens were exhibited :—

(a) X-ray plate and photograph showing the condition of the chest : high up and to the left of the plate, the shadow of the nail can be observed.

(b) The viscera : The lungs, heart, stomach, spleen, liver, &c., are transposed, and the appendix is also on the wrong side. Preparation by Dr. Bernstein.

DISCUSSION.

Dr. DAVIS added that on the X-ray plate the nail looked as if it were 3 in. long. If the cause had been recognized during life the child's life might have been saved. He thought all cases of unilateral lung disease should be examined with the bronchoscope.

Mr. WAGGETT desired to put in a general plea for direct inspection in obscure lung cases. He had seen an infant allowed almost to die with a piece of maize-leaf in its trachea for several weeks. When this was discovered by direct inspection and removed, cure immediately followed. The child was in hospital for some time, and the diagnosis was not made until the laryngologist was asked to examine with a view to the possible presence of diphtheria.

Dr. BROWN KELLY agreed as to the importance of examination with the tube where there was unilateral lung disease. That month, at the Edinburgh Court of Session, a dentist was sued for allowing a tooth to pass into the lung. The accident happened four years ago, and for three years the patient had been coughing up blood and matter. At the end of that period the tooth was recovered. If the bronchoscope had been used a great deal of trouble might have been saved. The dentist had to pay heavy damages.

Mr. HARMER said that it was not only in children that such cases occurred. When he was at the Metropolitan Hospital he was asked to see a man who had one-sided pneumonia which would not clear up. A skiagram had been taken and it was supposed to show an intubation tube. Years ago the patient had been treated for stenosis of the larynx by intubation. Mr. Harmer examined with the bronchoscope, and found pus coming from the right bronchus, but no foreign body. The tube suddenly slipped into an abscess cavity in the lung. In that cavity he was able to feel something metallic, and was lucky enough to bring it out, when it was seen to be half of a bi-valve tracheotomy tube. The patient had been wearing this for many years, and on one occasion when withdrawing it the tube was not complete, but he said nothing about it, and it had been in his lung all that time.

Mr. HERBERT TILLEY said that last year he showed a man who had had a mutton bone in his right bronchus for three and a half years. After he had been in the hospital for six weeks it was suggested that he should be examined with the bronchoscope. On the second occasion the mutton bone was found and removed. If the foreign body were lodged in the bronchus for some time there was inflammatory congestion around, and the skiagram was not likely to show it. He was told that unless an instantaneous X-ray picture were taken the foreign body would probably be missed.

Dr. WYLIE said he had had two or three cases of foreign bodies in the lungs, and had also seen other cases in consultation. In every case there was marked fœtor of the breath. When fœtor was present, and nothing in the form of bronchiectasis could be diagnosed, the chest should be X-rayed at once and a foreign body diagnosed. He considered fœtor a more or less diagnostic symptom in these cases.

Mr. MIDELTON said he had had two similar cases in his practice. In one case a man's pipe broke and a piece entered his lung. Several medical men saw him but could not make out what was the matter. The piece was subsequently coughed up. There was fœtor, and a constant cough. Another man swallowed a piece of mutton bone, and for eighteen months he was treated for consumption. He happened to cough it up, and then got well.

The PRESIDENT said it was agreed that in this matter members could teach their masters something, and insist that in every case of chronic unilateral pulmonary disease which was not tuberculous, examination should be made by X-rays and the bronchoscope.

Dr. H. J. DAVIS replied that there was marked factor in this case, and when this was present it pointed to gangrene of the lung; it did not necessarily mean that it was due to a foreign body. The radiographer, Dr. Morton, had great difficulty, as the child was struggling.

Tonsils Enucleated by means of a 16 mm. Mackenzie Guillotine.

By E. A. PETERS, M.D.

(a) THE tonsil is inserted into the ring of the instrument with the support of the anæsthetist's hand at the angle of the jaw, and drawn forward over the internal pterygoid and internal lateral ligament. The handle of the guillotine comes across into the opposite angle of the mouth. The attachment of the pharyngeal aponeurosis and superior constrictor to the jaw gives a fixed point so that the tonsil is dissected from the posterior pillar, while the anterior pillar of the fauces is protected by being made tense. Two separate adjustments and cuts are essential by this method, and the capsule is usually secured.

Specimens exhibited:—

- (i) Tonsil of child removed in two pieces by this method.
- (ii) Small recurrent septic tonsil removed in two pieces.

(b) Another method of removal: The earlier manipulation is the same, but the first cut only goes through the attachment of the tonsil to the anterior pillar; the blade is not pushed home. The ring of the tonsillotome is readjusted and the blade made to cut through, when the whole tonsil and capsule come away.

Specimens exhibited:—

- (i) Tonsil removed entire with capsule from a child, aged 8. (Note smooth capsule.)
- (ii) Two tonsils removed from a patient, aged 44, after repeated attacks of peritonsillitis. Note the fenestrated capsule.

In both methods considerable pressure is used. Bleeding is not severe, as the pillars are uninjured. Not so much of the lingual tonsil comes away as in the usual enucleation operation.

DISCUSSION.

Dr. WATSON-WILLIAMS said he had seen Dr. Peters operate on tonsils by the first method, and he fulfilled all the claims he put forward; the tonsils were removed and the capsule was practically complete. He did not suggest that that was the only method by which this could be done, but he could testify to the skill and success of Dr. Peters with his method. He (the speaker) had recently used the method described by Whillis, which answered at any rate for cases in children. For adults he preferred other methods.

Mr. NORMAN PATTERSON said that for the last week or two he had removed tonsils by the method described by Sluder, and Whillis, of Newcastle, in the routine of out-patient work. One could completely enucleate the tonsils in 90 per cent. of cases. The patients' ages ranged from $2\frac{1}{2}$ to 20 years. He showed a bottle full of tonsils which he removed in two days. They represented a consecutive series, and were not specially picked out for demonstration purposes. They were nearly all completely enucleated. The instrument used was a Heath's modification of Mackenzie's guillotine.

Mr. HERBERT TILLEY remarked that there were many different ways of doing the operation. One which was favoured by many was to seize the tonsil with forceps such as those which he introduced two years ago, free the anterior and posterior pillars, and then slide the snare over the tonsil. The wire loop then found its way into the bed of the tonsil, and on putting on pressure the whole gland came away. The advantage of the snare was its tendency to stop after-bleeding, because of the pinching of the tissues at the lower pole of the tonsil. He had tried many methods, and he preferred the snare. He had removed tonsils from childhood up to 54 years of age, and now used the same method in all cases. It was true that one had to use a general anæsthetic, but the results were as good as one could wish for, and there was practically no greater risk in enucleation than in tonsillotomy.

Mr. HARMER said that during the last three months at St. Bartholomew's Hospital enucleation of tonsil had been done on a large number of children by the guillotine. The after-results were not quite satisfactory, because more children than formerly had to be kept in the hospital for very severe bleeding. Two or three cases were admitted on the fourth or fifth day because of severe bleeding after the operation. It would be well to discuss the question at a future meeting—namely, as to whether there was greater danger of bleeding from the tonsillar fossæ when the tonsil was removed by the knife rather than by some form of snare. He would be pleased to report his cases.

Dr. DAN MCKENZIE corroborated the idea that bleeding was more frequent and more severe after enucleation of tonsils than after their removal by the ordinary method. The complete operation by any method necessarily exposed the patient to more risks from bleeding than the other did. Was that bleeding

ever fatal, and if so, how often? He himself believed the risk to life from the bleeding was not great. Some time ago he showed an instrument he had devised for enucleating tonsils, and in his hands it had proved more satisfactory than any other. He enucleated in most of his cases. The tonsil could be freed in front, and then removed by the guillotine afterwards. It was seldom necessary to insert the guillotine more than once in this method.

Sir FELIX SEMON said he hoped he would not be regarded as a reactionary, but during his experience and his study of the literature of the subject, the question had again and again obtruded itself to his mind whether it really was necessary to enucleate so many tonsils as was nowadays the practice. He was always ready to welcome any progress, and he was glad that in this method of enucleation one had a means of dealing with some troublesome forms of enlargement of tonsils—namely, those in which the tonsils were constantly suppurating and forming cheesy collections, or those forms in which there was one acute inflammation after another, and in which partial removal had been no good. If there was a method which did away with the necessity for ever-repeated operation in those cases, so much the better, but, generally speaking, he had always tried in his own practice to observe a true proportion between the gravity of the illness and the measure of interference, and could not help asking himself whether it was really necessary to enucleate so many tonsils when smaller measures would suffice. He did not consider that the loss of blood after the operation was a matter of indifference in a growing child, even though the child would eventually make it good. He certainly did not wish to be regarded as an adversary of enucleation, but looking back at the proportion of recurrences in his experience of thirty years, he was of opinion that mere tonsillotomy in the great majority of cases fully sufficed.

Mr. WAGGETT said that this was not a discussion on the whole subject of removal of tonsils. Such a discussion would be interesting, for it seemed clear that for each man his own method was the best. He thought that protest should be made against Dr. Dan McKenzie's supposition that the wounds bled more freely after enucleation than after tonsillotomy. In his own experience they bled less after enucleation, provided that blunt instruments, such as an elevator and snare, were used. In answer to Sir Felix Semon, everyone would agree with him that "the punishment should fit the crime," but in his experience the punishment of enucleation with blunt instruments was a lesser one than that of tonsillotomy.

The PRESIDENT agreed that the capsule of the tonsil limited for a long time the spread of malignant growth which started in the tonsil. The question of the protective power of that capsule must be considered. With regard to enucleation, at the meeting of the British Medical Association in London two years ago, he was one of the few who said that enucleation could be carried out with the guillotine. Others said it was understood that no tonsil could be taken out completely with the guillotine. Dr. Peters and Mr. Norman Patterson

now confirmed what he had said. The question which would have to be discussed when the matter was brought forward was whether the dangers from hæmorrhage and the anæsthetic were greater, and what was the best method for removing the tonsils. Also, it would have to be considered whether they should be removed entire in all cases.

Dr. PETERS, in reply, said that it was not the size of the tonsil which determined its degree of sepsis. The small tonsil he showed, which was removed in two portions, was full of septic material, and it had caused enlarged glands. Ninety-five per cent. of children had enlarged cervical glands at the angle of the jaw in association with septic tonsils. Doubtless it was not necessary in every case to remove the whole tonsil, but there were cases in which one saw trouble from a piece of tonsil which had been left, and complete removal seemed desirable. The manipulation was satisfactory for hidden tonsil, but not so good for the long tonsil, which went down to join the lingual tonsil. With regard to bleeding, he thought his procedure had a distinct advantage. Both methods of enucleation produced less hæmorrhage, whether dissected by blunt instruments or by means of the tonsillotome. He did not think there was much advantage in pushing the tonsil through the guillotine.

Asthma with Swollen Middle Turbinals.

By E. A. PETERS, M.D.

L. W., AGED 42. The illness commenced eighteen months ago with paroxysmal rhinorrhœa; lately the patient has developed asthma, which affects her most nights. The nose presents a condition of chronic rhinitis; the inferior turbinals are swollen. The middle turbinals are œdematous and compress the septum. This last condition is characteristic of nasal asthma.

Tumour of the Left Antrum.

By E. A. PETERS, M.D.

W. H., AGED 14. A swelling has been noticed for twelve months. The left maxillary antrum has expanded in every direction except towards the palate. The wall is everywhere hard. The antrum is opaque to transillumination.

DISCUSSION.

The PRESIDENT asked whether the antrum had been explored. He believed it would turn out to be a peridental cyst, and that the antrum was clear. Perhaps Dr. Peters would puncture it and explore from the nose; and, secondly, operate on it from the canine fossa. It did not follow the outline of the antrum. It was more suggestive of a cyst invaginating the antrum, and to a great extent replacing it. He hoped the case would be reported again.

Dr. H. J. DAVIS did not think it was antrum, because it did not bulge towards the palate nor encroach into the nose. He regarded it as a superficial condition at the outside of the malar and superior maxillary bones.

Dr. BROWN KELLY thought it was a maxillary cyst or malignant disease in the antrum. It looked and felt like a cyst, but there were no decayed teeth, and it had grown rather rapidly. Aspiration would settle the question.

Dr. PETERS replied that he had not explored the antrum, but had transilluminated it. He would report the case later on.

Enophthalmos; Total Ophthalmoplegia; Fixation of the Eye to Floor of Orbit and Partial Blindness. ? Result of Curetting the Ethmoidal Region in April, 1911.

By HUNTER TOD, F.R.C.S.

THIS patient, a male, aged 60, presented himself at the ophthalmic department of the London Hospital in December, 1911, suffering from pain in the left eye, with a chronic inflammatory swelling over the malar region and lower part of the orbit. He stated that the swelling began shortly after he had undergone an operation (at another hospital) for nasal obstruction on the left side. Examination of the nose showed that the ethmoidal region on that side had been scraped out and the middle turbinate removed; that there was no growth in the nose, and that the left antrum was brighter than the right on transillumination. On account of his eye trouble he was an out-patient in the ophthalmic department for some time, doubt being expressed as to the cause of the eye condition. The eyeball became gradually fixed, the pupil dilated and ceased to react; the optic disk was clear. An irregular hardish mass could be felt on the inner side and floor of the orbit. Since the

operation there was a history of some slight purulent and blood-stained discharge from the nose. As the eye got more fixed, it became drawn down into the lower part of the orbit, so that the upper part of the cornea could only just be seen. Later, the cornea became hazy above, and finally retraction downwards of the eyeball prevented even the sclerotic being seen. The finger could be passed right back over the eye along the upper part of the orbit and nothing abnormal could be felt. It then appeared evident that the changes in the eye and orbit were due to some definite retraction downwards of the eyeball as if the floor of the eyeball had been curetted away. Mr. Hunter Tod thought that there was no doubt that the condition was secondary to the operation performed, but he had not yet discovered who the operator was, or what had been done. Although there were signs of inflammation, there had been apparently no acute peri-orbital abscess, probably owing to the fact that there was free drainage into the nose.

[*Addendum*.—Since the meeting Mr. Tod has made an exploratory incision along the lower margin of the orbit. He then discovered that the whole floor of the orbit had been completely curetted away, together with the inner wall of the antrum. The finger could be passed through the nostril out of the wound, and posteriorly behind the eyeball, along the optic nerve. As there seemed nothing definite to do, the wound was re-sutured. The patient still complains of supra-orbital headache. The question arises whether the eye should be removed, but owing to the septic condition within the orbit, the ophthalmic surgeon (Mr. Lister) hesitates to do this.]

DISCUSSION.

The PRESIDENT said he had never seen a similar accident either in his own practice or that of any colleague.

Dr. H. J. DAVIS said the eyeball was rotated downwards, as the pupil was looking directly downwards towards the antrum. It looked as if there had been suppuration in the orbit.

Dr. DAN MCKENZIE remarked that it might have been syphilitic necrosis, and that one could not very well draw lessons from the case without details of the operation on the nose.

Bleeding Tumour of the Septum.

By HUNTER TOD, F.R.C.S.

THE patient, a boy, aged 18, states that he has had epistaxis since Christmas. His medical attendant observed a small growth on the left side of the septum, part of which he removed by means of a snare eight weeks ago. The growth recurred rapidly, and a similar operation was performed two weeks later. On examination a polypoid growth, the size of a large pea, is seen to arise from the anterior superior margin of the septum; it bleeds freely on probing.

[*Addendum*.—Since this report the patient has been operated on, the growth being cut away from the septum. A section taken by Dr. Pegler demonstrates a true "bleeding polypus of the septum."]

Instruments for Use with Brünings's Tubes.

By IRWIN MOORE, M.B.

(a) A PAIR of forceps for removing foreign bodies—e.g., coins, tooth-plates—from œsophagus.

(b) A pair of cutting pliers for cutting through a tooth-plate impacted in the œsophagus.

Dr. Moore explained that the instruments were for cases for which Brünings's forceps might be too light, for they occasionally broke during manipulation. The forceps shown were of use for extracting tooth-plates and coins. They had to be closed before being passed down the tube, and there was plenty of room left for seeing the foreign body.

Lupus of the Nose treated by Tuberculin.

By W. STUART-LOW, F.R.C.S.

MALE, aged 15. The usual treatment having been of little avail, a weekly injection of tuberculin has greatly improved the condition in the course of a month.

Large Cyst on the Soft Palate of a Boy.

By W. STUART-LOW, F.R.C.S.

THE cyst has existed for years, but has never given any inconvenience.

Mr. STUART-LOW, in answer to a suggestion made by Dr. Paterson, said that the cyst was growing from the palate on the inner side of the arch, and he agreed it might possibly be an internal branchial cyst.

Case of Large Aberrant Thyroid in a Woman.

By W. STUART-LOW, F.R.C.S.

THE case was shown three years ago, when the patient exhibited a large aberrant thyroid far back and deeply situated in the tongue. She had been operated upon on three occasions for its removal at London hospitals before coming to the clinic, but recurrence had always taken place. The method of splitting the tongue down the middle and thorough eradication, introduced by the exhibitor, has succeeded and no evidences of myxœdema have supervened.

Total Laryngectomy by a Suicide.

By DOUGLAS HARMER, F.R.C.S.

THE larynx shown was sent by Dr. Jamison, of Horsham, with the following history: The patient, a woman, aged 35, removed her larynx with an ordinary dinner knife and it was found lying on the floor. A square hole was left in the front of the neck bounded above by the hyoid bone, laterally by the sternomastoid muscles and the carotid arteries, both of which were freely exposed. The upper end of the trachea was found just above the suprasternal notch and the œsophagus a little higher. The floor of the wound was formed by the prevertebral muscles

and spinal column. No large vessels had been wounded. The woman was conscious but very collapsed and had lost altogether nearly a quart of blood. She was removed to the local hospital, where she rallied, but again collapsed twelve hours later and died in about five minutes.

The specimen is similar to one shown recently by Dr. Peters.

The PRESIDENT remarked that the absence of immediate shock was peculiar, as one would have expected shock after such violent excision of the larynx. Dr. Peters's patient ran 200 yards after a similar procedure.

? Pneumococcic Laryngitis followed by Suppurative Arthritis, Endocarditis, Septicæmia, and Death.

By DOUGLAS HARMER, F.R.C.S.

(For A. ABRAHAMS, M.B.)

HEART exhibited to show large recent vegetations of tricuspid valves. The history of the case was as follows: A man, aged 45, was admitted to the hospital with urgent dyspnoea and stridor of three days' duration. The onset of the disease was said to have been sudden. The larynx was œdematous and intensely red. He had slight bronchitis, and a temperature of 102·6° F. The urine was very scanty and contained 0·1 per cent. of albumin. He had slight œdema of the hands and legs. The cultivation of the throat showed a majority of pneumococci. During the next four days the patient steadily improved, the larynx recovered, and it was thought that he might soon be well enough to leave the hospital. On the sixth day he had a rigor, with a temperature of 104·6° F. He then had daily rigors for six days, when he complained of pain in the right shoulder-joint. An exploration was made by Mr. Gask and thick, ropy pus was found in the subacromial bursa. Cultivation of the above showed a pure growth of streptococcus. Some improvement followed for a few days; afterwards there were daily rigors, the heart became affected, and streptococci were recovered from the blood. Death occurred three weeks after the operation on his shoulder.

Post mortem: The larynx was still a little inflamed; the heart had large green recent vegetations on the tricuspid valves such as are usually found with pneumococcic infections. The heart's blood contained streptococci; the lungs showed recent pleurisy and septic infarcts; spleen and liver were both enlarged.

Sir FELIX SEMON said he had recorded a case in which a well-known colleague died, after several months' illness, from a condition which began with pure pneumococcus infection, upon which a tuberculous infection supervened. Until a few weeks before death the laryngeal condition was purely tuberculous, whilst examination of the pharyngeal ulcers showed almost pure cultures of pneumococci.

Case of ? Lupus of Nasal Septum.

By DAN MCKENZIE, M.D.

FEMALE, aged 41. The disease seems to be limited to the anterior area of the septum on both sides. No perforation can be discovered. Attention is directed to the turgid and swollen appearance of the mucous membrane. There is a history of eight years' nasal obstruction, and the chronicity of the disease—if the disease has actually been in existence for so long—coupled with its limitation and absence of destruction, is remarkable.

DISCUSSION.

Mr. HERBERT TILLEY said he would be surprised if the case were lupus, or even lupoid. The mucous membrane over the anterior part of the septum seemed very turgid and wet. He thought there was warrant for relieving the obstruction by removal of some of the septal cartilage. Dr. McKenzie could then remove a small portion of the mucous membrane, the examination of which would enable him to give some further information as to the nature of the disease.

The PRESIDENT said he did not think the case had the characters of lupus, either in the deposit or the abrasion of the surface. The patient had had sneezing for many years, and there was a corrugated thickening. There was the same condition on the other side, and on the turbinals.

Dr. H. J. DAVIS suggested frictions of lactic acid.

Dr. MCKENZIE replied that his own impression was that it was not lupus, or if it was, that it was of an atypical kind. The microscopical report was that it was simple granuloma. He would carry out the treatment recommended.

**Tertiary Specific Ulceration of the Pharynx undergoing
Malignant Transformation.**

By DAN MCKENZIE, M.D.

THE patient is an old man, aged 81. According to the history the throat has been troubling him for three months. The syphilitic element is still active; it has destroyed the uvula, much of the soft palate, and has eroded the tissues in the tonsillar regions. Here in the region of the left tonsil a raised area, rather nodular in appearance and hard to the feel, made us suspect the existence of malignancy. The nodule was therefore removed, and examined by Dr. Wyatt Wingrave, with a positive result. There is a small hard gland under the left angle of the jaw. Wassermann reaction negative. The patient is on iodide of potash, and has already benefited by it.

The outset of epithelioma in the midst of what seems to be active tertiary ulceration is an interesting clinical experience.

**Subsequent History of a Case of Swelling in the Right Tonsillar
Region, in a Woman, aged 24.**

By W. H. KELSON, M.D.

THE case was shown at the February meeting.¹ Operation: Although the appearances were very suggestive of deep-seated pus none could be found. The right tonsil was enucleated, and the glandular masses excised. The patient did well at first, but died on March 2 of pleuro-pneumonia. Microscopical section of gland shown.

DISCUSSION.

Dr. KELSON added that most of the members who spoke on the case agreed that it was probably inflammatory, and that there was pus somewhere. It showed how deceptive appearances might be, because no pus was found anywhere, and it turned out to be growth, probably sarcoma. He enucleated the tonsil first, and later removed the mass from the outside. The patient seemed to do well for a fortnight, but then got pneumonia and died.

¹ *Proceedings*, p. 80.

THE PRESIDENT said he had expressed the opinion that it was tuberculous, and that there was no suppuration. The case would be submitted to the Morbid Growths Committee.

**Microscopical Section of Growth removed from Trachea of
a Woman, aged 24.**

By W. H. KELSON, M.D.

THE naked-eye appearances were those of a papilloma, but microscopical examination showed tissue resembling the thyroid gland. The report of the Morbid Growths Committee will follow later.

The case was shown at the last meeting.¹

**Specimen presenting Traction Diverticulum of Œsophagus and
Atrophy of Left Vocal Cord, due to Infiltrated Gland
beneath Arch of Aorta.**

By A. BROWN KELLY, M.D.

MR. —, then aged 71, consulted the exhibitor in 1905 for hoarseness of a few months' duration. The left vocal cord was found stationary in middle line with concave edge; this condition remained unchanged throughout life. There was no disturbance of deglutition. Death took place early this year from weakness and purulent bronchitis. In the concavity of the aortic arch a small, darkly pigmented gland is seen. In consequence of cicatricial contraction it has involved the left recurrent laryngeal nerve, and has produced a traction diverticulum in the adjacent wall of the œsophagus. On the left side, owing to atrophy, the vocal cord is thinner, and the ventricle of Morgagni more open than on the right side.

¹ *Proceedings*, p. 106.

Œsophagus with Perforations due to Ulceration produced by Foreign Bodies.

By A. BROWN KELLY, M.D.

THE subject, an imbecile lad, aged 16, from whom a coherent statement could not be obtained, was suspected of having swallowed a foreign body. The medical man consulted examined him with X-rays, but finding nothing abnormal prescribed a purgative, with the result that a dozen acorns were passed. As marked inability to swallow persisted, he was sent to the exhibitor about a fortnight after the supposed accident for examination of the œsophagus. At the lower end of Brünings's longest tube when fully introduced a foreign body was encountered; and lying above it were two peas. The body itself was firmly embedded in the posterior wall of the gullet, and the surrounding mucous membrane presented many granulations. After considerable trouble the body, which proved to be another acorn, was broken up and removed piecemeal. Beneath it a large part of a vertebra (? sheep's) was found and comparatively easily extracted. As a perforation into the trachea had been detected before operation no food was given by the mouth. In spite of this precaution, and efforts to keep the parts clean, the patient died a week later. The post-mortem revealed multiple abscesses and gangrene of the lungs.

The specimen shows five perforations in the posterior wall, where ulceration had extended to the underlying vertebral column, and one in the anterior wall communicating with the trachea.

Œsophagus with Cicatricial Stenosis caused by Carbolic Acid.

By A. BROWN KELLY, M.D.

THE subject, a man, aged 51, swallowed by mistake two mouthfuls of carbolic acid. On admission to the infirmary seven weeks later he could get over only single sips of fluid. His debilitated state and the smallness of the stricture interfered with treatment. Death, accelerated by phthisis, took place about three months after the accident. The stricture has been slit up; it was almost impervious, and extended for a distance of about 2 in. in the lower third of the œsophagus, ending 2 in. above the cardia.

Cancer of Œsophagus projecting into Trachea.

By A. BROWN KELLY, M.D.

THE patient, a man, aged 43, developed a large swelling in front of neck in June, 1911. On being opened very foul pus escaped and continued to discharge freely, mixed frequently with food, until his death. In October, first examined by exhibitor, who found abductor paralysis of left cord, bulging of posterior wall of trachea, and ulceration of upper part of œsophagus. Dysphagia became pronounced only towards end of year. Gastrostomy early in January. Death a month later. The growth, beginning at upper end of œsophagus, extends downwards for a distance of 5 in., and involves the entire circumference. The anterior wall, 2 in. below upper margin of growth, presents an area of ulceration and pouching towards the trachea. At this level there is bulging of the posterior wall of the trachea for a distance of about 2 in., but no erosion of the mucous membrane.

A Case of Laryngeal Crises with Abductor Paralysis.

By EDWARD D. DAVIS.

A COACHMAN, aged 38, came to the hospital in May, 1909, complaining of difficulty in breathing of some three or four months' duration. About twice a week he would suddenly jump out of bed, make a crowing noise, and would be unable to breathe. The attack lasts a few seconds. He is short of breath on exertion and breathing is occasionally stridulous. He contracted syphilis six years ago.

The patient was admitted under Dr. Mott for observation for ten days, and the above diagnosis was confirmed. On examination of the larynx, the vocal cords are in a position of complete adduction. During deep inspiration there is scarcely any abduction, but there is a narrow chink in front and behind the vocal processes. The condition of the larynx is precisely the same now as it was in May, 1909. The pupils are unequal and do not react to light; optic disks normal. Knee-jerks present, lightning pains, difficulty of micturition; positive Wassermann reaction obtained twice.

DISCUSSION.

Sir FELIX SEMON remarked that the interest of this case lay in the fact that the knee-jerks were not yet abolished, and that was important as showing the diagnostic value of the abductor paralysis which, in his experience, might precede by as much as two or three years the other symptoms of tabes. Therefore in every obscure case, whether of unilateral or—more frequently—bilateral abductor paralysis, the possibility of tabes should be kept in view, even if none of the other symptoms of tabes were as yet present. He had shown one case of that kind before the Clinical Society in 1878, in which the laryngeal symptom preceded all the other signs of tabes by two years, and this was, indeed, the case from which the whole doctrine of the greater vulnerability of the abductor fibres in organic disease of the motor laryngeal nerves had started.

Mr. DAVIS, in reply, said tracheotomy had been arranged for several times, but for some reason had been postponed. The physicians thought he was not sufficiently ill to have it done. Then he disappeared, and arrangements later to have it done were met by his refusal. Dr. Mott's opinion was that the changes were high up in the cord, possibly in the region of the medulla, perhaps a localized meningitis.

Epithelioma of Pharynx: Operations.

By NORMAN PATTERSON, F.R.C.S.

MALE, aged 52. Pain in throat on swallowing and coughing first noticed about April, 1911. Patient has been treated in St. Mary's hospital for trouble in the gullet and stomach, said to have followed the swallowing of zinc sulphate eighteen months ago. Throat first examined beginning of November, 1911. Irregular growth, apparently superficial, affecting anterior aspect of right side of soft palate and upper part of anterior pillar and tonsil. Microscope showed typical epithelioma. There was a hard gland at the site of carotid bifurcation.

First operation (November 9, 1911): Right anterior triangle cleared of glands and fascia with exception of submaxillary region. Several inches of internal jugular vein, to which gland was adherent, resected. A large portion of sternomastoid, together with deep fascia and shotty glands in relation to its under surface, removed in one mass. The condition of the patient made it impossible to proceed with the removal

of the primary growth, and he subsequently developed hypostatic pneumonia, which left him in such poor health that no other operation was possible for some time. When seen in February the growth had crossed the middle line, and involved the whole uvula. It covered the tonsil and anterior pillar, involving also the mucous membrane in front of this structure. Below it had crept on to the tongue.

Second operation (February 12, 1912): Preliminary laryngotomy and splitting of cheek. The mass, together with half an inch of mucous membrane at its periphery and as much healthy tissue on its deep aspect as possible, was removed. This dissection included the removal of a portion of the tongue and floor of the mouth. At the suggestion of Dr. Woodwark, intravenous ether was administered by Dr. Maclean. The recovery this time was free from any complications. Shortly after the first operation paralysis of the right cord was noticed, and this remains. There is some fullness in the neck just below the tip of the mastoid process. This has been watched for three months and has not increased.

Growth in Post-nasal Region.

By W. JOBSON HORNE, M.D.

MAN, aged 58. Growth starts from right side. Duration about nine weeks. Deafness in right ear.

Dr. KELSON said he considered it was similar to the cases recently described by Mr. Trotter with the three cardinal symptoms—viz., deafness, paralysis of the palate, and neuralgia—except that the man had not had much pain.

Stenosis of Larynx.

By L. H. PEGLER, M.D.

WOMAN, aged 60, with laryngeal stridor of more than one year's duration. There is great swelling of both ventricular bands, and also of the left vocal cord; the right vocal cord is not visible. The dyspnoea has increased during the last year. The tuberculin tests have been found to be negative. The question of treatment is an important one.

The PRESIDENT said the woman had extreme stenosis, evidently more than was due to the infiltration of the ventricular band. He thought that if such diseases as syphilis and tubercle had been excluded, it would be necessary to perform exploratory laryngo-fissure.

**Report on Mr. Wilkinson's Specimen of (?) Papilloma removed
from the Posterior End of the Right Inferior Turbinal.¹**

MR. WILKINSON'S specimen has been submitted to the Morbid Growths Committee. The members who have examined it are of opinion that the specimen is an example of moriform hypertrophy of the turbinate, and that the term papilloma is not applicable to it.

¹ Shown at the meeting on March 1. See *Proceedings*, p. 109.

Laryngological Section.

May 3, 1912.

Dr. STCLAIR THOMSON, President of the Section, in the Chair.

Demonstration of the Treatment of Malignant Growths of the Mouth and Pharynx by Diathermy.

By DOUGLAS HARMER, F.R.C.S., and H. LEWIS JONES, M.D.

THE apparatus was exhibited and the method of application demonstrated. A general anæsthetic is required: the operation can be completed in three to five minutes; there should be no bleeding, even with vascular tumours; there is very little pain, even after extensive burning; sloughs separate in five to ten days, leaving a healthy wound which heals rapidly; the surrounding tissues are little inflamed; there is hardly any scar tissue after the whole growth has been destroyed, and the parts are eventually covered with soft mucous membrane; the danger of secondary hæmorrhage is said to be slight.

Three cases, illustrating the after-results, were shown:—

Case I: Epithelioma of Soft Palate, anterior Pillar of the Fauces and Base of Tongue: a hard, nodular Growth adherent to Upper and Lower Jaws.—The patient, a man, aged 64, stated that he had noticed the growth for six weeks; there had been no pain, but some trouble with swallowing on account of the difficulty in opening the jaw. Two and a half years previously an epithelioma was removed from the lower lip by Mr. Gask. Treated by diathermy on March 24, 1911. The wound healed rapidly without pain or much scarring. There has been no tendency to recurrence until the last few weeks. There are now some nodules in the scar and some glands in the neck. The growth in this case was extensive, but yielded at once to treatment, and is the best result that I have seen.

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Case II: Extensive Epithelioma of Soft Palate, Tonsil, and Tongue, undergoing Treatment.—A labourer, aged 50, was admitted to the Hospital on February 16, 1912. He had noticed a hard lump on the right side of his neck for two months, later pain in his right ear and difficulty in swallowing. A large, hard, fungating growth was found involving the right half of the soft palate, the right tonsil, fauces and tongue slightly. The growth extended across the palate to the middle line and was firmly attached to the jaws, so that the palate was quite fixed. Some hard, slightly movable glands were found behind the right angle of his jaw. A section of the growth showed epithelioma. February 22 and March 4 and 14, ulcer treated by diathermy, 1·2 to 1·5 amp. The patient had very little pain after these applications, the sloughs separated rapidly, leaving a healing wound with little surrounding inflammation. There was no hæmorrhage after the operations. On April 3 the glands were removed from the right side of the neck with the internal jugular vein. The wound healed normally, but fourteen days later, on his return from a convalescent home, a small abscess was found under the scar in his neck. There now appears to be no growth excepting a small mass near the tonsil and on base of the tongue; the palate moves well. The swallowing is much improved.

Case III: Extensive Epithelioma of Soft Palate, Tonsil and Tongue, undergoing Treatment; Growth deeply Ulcerated, hard, and causing Complete Fixation of the Right Half of the Palate.—The patient, a man, aged 52, had noticed soreness of the back of the tongue and throat for three months. Two months ago a swelling appeared below the angle of the right jaw, and recently he has not been able to open his mouth properly. On April 11 he was given an extensive application of diathermy (1·5 amp.). Afterwards he had pain for two days which was probably due to extensive burning of the base of the tongue. Large sloughs separated without hæmorrhage, and he can now open the jaw and swallow better. The soft palate is soft and moves freely. On April 24 large glands and the internal jugular vein were removed from the triangles of the right side of the neck and a group of glands from behind the right clavicle. Six days later the wound in the neck became inflamed and a drop of pus was let out from under the scar. This case is shown to illustrate the improvement obtained by one application of diathermy.

DISCUSSION.

Dr. LEWIS JONES explained that the apparatus used was a modified form of that employed for treatment by high frequency currents. It was known that currents which oscillated at a very high speed could be passed through the human body without causing any shock or sensation, even when a current of 500 ma. or more was passing. A feature which had been partly overlooked, was that the patient's tissues were warmed by the passage of such a current, just as an incandescent lamp filament was warmed by the passage of electricity. Among the effects of electricity on the human body there were two main groups: there was the shock and the muscular contraction which were ionic phenomena, and there was the thermal effect. Ions moved with comparative slowness, so if the electric oscillations were rapid enough, the sensory and motor phenomena disappeared, and only the thermal remained. The apparatus now exhibited was one of the new devices for producing sustained oscillations of very great frequency. It permitted a patient to bear a current of an ampere—i.e., 1,000 ma.—and to feel nothing more than a comfortable sensation of warmth, which slowly spread up the arms when the electrodes were held in the hands. In order to use this heat for surgery, it was necessary to concentrate it, and this was done by using a small button-sized electrode. The heating effect was then very rapid, and the degree of heating was inversely proportional to the cross-section of the small electrode, so that if one electrode was small and the other large, the heating effect was almost entirely in the region of the small one. Moreover, the heating effect was not superficial, but penetrated to a considerable depth, as was shown by Dr. Lewis Jones in an experiment upon a piece of liver and of kidney tissue.

Mr. HARMER added that it was remarkable how quickly the operation could be done; apparently any amount of tissue could be destroyed, and the patient suffered very little. In a throat case the patient could swallow painlessly within twelve hours. Moreover, afterwards the wound healed over with soft tissue, and there was an absence of scarring and binding down of the parts which often followed ordinary surgical procedures. Cases besides those with malignant growths had been treated by the method, such as tonsils, nævi, and innocent growths in the mouth and palate, and there had been no hæmorrhage. It would be found to be a valuable method of dealing with extensive ulcerations of the mouth. For throat cases, the larger electrode was laid on a towel placed across the front of the chest.

Mr. HERBERT TILLEY asked by what method one prevented burning into the healthy tissues; or did the process affect morbid tissues more readily than normal ones?

Dr. WATSON-WILLIAMS asked whether the small electrode was allowed to penetrate deeply. Also, whether the therapeutic effect depended entirely on

the burning, or whether, beyond the area burned, there seemed to be an influence on the neoplasm. Further, he asked how long a malignant growth had been under observation since the treatment, and whether Mr. Harmer had been led to suppose that such growth could be permanently eradicated by the method.

Mr. DE SANTI congratulated Mr. Harmer and Dr. Lewis Jones on the excellent results obtained, and presumed it was meant as palliative treatment only. It occurred to him that in early cases which were amenable to operation, there might be a temptation to try this method first, and valuable time thereby lost, but in the class of case shown to-day there seemed to be a most useful field for diathermy.

Mr. T. JEFFERSON FAULDER said he had seen the cases now shown before they were operated upon. From one or two of them he removed a piece of growth. They were cases upon which no one would operate. He was much struck by the ease with which the method could be applied. When Dr. Nagelschmidt was in London, he removed a tonsil by the method; it was a simple process, and there was no bleeding; and the difference from the other side, from which the tonsil was removed by the guillotine, was very striking. He agreed that there might be a difficulty in deciding how far the necrosis went, and Dr. Nagelschmidt said that to estimate the depth of the coagulation was a matter of experience.

Mr. HARMER, in reply, said that the degree of penetration depended on the operator's wishes. With a flat electrode one could burn the surface, and it penetrated to about the same depth as the extent of surface. A pointed electrode travelled into the tissues quite easily, indeed, the difficulty was to prevent it travelling too deeply. To avoid burning normal tissue, one should watch how far the burn was spreading. The first case was the one that had been under treatment for the longest time; this was treated at the beginning of November, and at present there were no signs of recurrence. It was not absolutely certain that this was a case of epithelioma. They had treated one case of extrinsic carcinoma of the larynx by the method, and the patient was apparently doing very well. At least half the growth was destroyed by the first application; it was made under general anaesthesia, through the bronchoscope. The patient was allowed to go out of the hospital after a week. Later, he was reported to have died of septic pneumonia. It had not yet been used by them for tubercle, but he did not see why it should not be used for the destruction of any lesion. The great point was the slight degree of sloughing. The apparatus cost about £80, but could be hired from Messrs. Siemens.

A Man unusually Tolerant and Easy of Laryngeal Examination.

By W. STUART-LOW, F.R.C.S.

THE interior of the larynx and trachea can be seen simply by inserting a mirror, without the tongue being held. For teaching purposes he has been most useful.

Case of Chronic Loss of Voice in a Man.

By W. STUART-LOW, F.R.C.S.

THE epiglottis is reduced to a stump, and the ventricular bands and vocal cords have been deeply eroded. The Wassermann test was negative, and no tubercle bacilli have been detected. The condition has improved greatly during the last month on weekly injections of tuberculin (T.R.).

A Case of Double Ethmoidal Mucocoele.

By A. S. COBBLEDICK, M.D.

MRS. L., aged 34, was placed under my care by Dr. David Knight. The patient has been aware of a swelling between the right side of the nose and the right eye as long as she can recollect. She thinks it possibly dates from a severe attack of diphtheria, complicated by aural and nasal discharge, at the age of 7. During the last twelve months the swelling has increased, there is a feeling of dullness, sleepiness and epiphora not noticed before the last six months. She has never suffered from diplopia.

There is a tense, fluctuating swelling in the region of the right internal canthus. Over its centre the internal tarsal ligament is tightly stretched; above, it extends to the orbital plate of the frontal bone, but is not attached to it. A similar, but much less marked, condition exists on the left side. The right nasal fossa is occluded by a large, probably cystic, middle turbinate bone. No muco-pus in the nose.

DISCUSSION.

Dr. COBBLEDICK added that the patient had some nasal discharge at times, but he had not seen muco-pus in the nose. By transillumination the antra and frontal sinuses were clear. By passing a fine lachrymal probe along the lower canaliculus one could demonstrate the lachrymal sac between the swelling and the internal tarsal ligament, which would not be the case if it were a frontal sinus mucocele.

Dr. DAN MCKENZIE said he had recently seen a patient with a bilateral swelling on the side of the nose, which proved to be mucocele of both lachrymal sacs. He himself had at first taken the disease to be ethmoidal mucocele, but on referring the patient to an ophthalmic surgeon the proper diagnosis was arrived at.

Mr. HERBERT TILLEY thought the measure first suggested by the exhibitor should be carried out, as it should be possible to get at the ethmoidal cells from the inside of the nose. If that failed, an external operation could be carried out later.

Dr. D. R. PATERSON agreed that the case should be treated from the inside. In a similar case of his own after such treatment, the patient could easily empty the swelling by pressure, and in eighteen months it had entirely ceased to appear.

Dr. COBBLEDICK, in reply, said he felt sure that it was not connected with the lachrymal sac. The points in favour of mucocele were, that it had been there from the age of 7, and that it certainly got larger. It was a collection of fluid, which did not drain into the nose.

Chronic Œdema of the Fauces and Larynx in a Boy.

By H. LAMBERT LACK, F.R.C.S.

THE patient, G. C., aged 12, has been attending the London Hospital for nearly five years, and throughout that time his condition has been practically the same. The uvula was as large as a finger. This was removed for microscopical examination, but merely showed round-celled infiltration. The stump of the uvula is seen thickened, the pillars of the fauces are œdematous, the epiglottis is considerably swollen, the arytenoids, especially the left one, are so œdematous that they flap about and look like mucous polypus. Anti-syphilitic remedies have had no effect, and the diagnosis has remained in doubt.

Last February the boy reappeared at the hospital after a year's absence, and the Wassermann reaction was tested and found positive. I also found that the boy had suffered from nodes on the bones some seven years ago. He has recently been on mercurial inunctions without any improvement.

I have seen four or five similar cases, and have showed one at this Society, with microscopical sections of the epiglottis and arytenoids. In none of them has a positive diagnosis been made. In all the cases other evidences of syphilis have been absent. The question therefore arises as to whether the lesion in this case is syphilitic. I have seen chronic œdema in other cases of congenital syphilis and incline to the idea that the lesion really is syphilis, in spite of the negative result of treatment.

DISCUSSION.

Sir FELIX SEMON said he believed Dr. Lack agreed that the term "œdema" prejudged the case. He himself would be cautious about saying anything more than that it was "a sort of swelling." In the similar cases of Dr. Logan Turner's and his own there was simply an increase in round cells, and no other characteristic. In his own cases there was no syphilis, which Dr. Lack believed to have been present in this case; the swellings receded and the patients recovered. That was the reason he objected to the term applied by Dr. Logan Turner—namely, "sclerotic" hyperplasia—because that implied there had been interstitial changes which were irremediable. The fact that the patient improved showed that the word "sclerotic" should not be applied.

Dr. DUNDAS GRANT said it seemed to be fairly well established that there was a syphilitic basis in this case. In some instances of specific keratitis, published by Mr. Sydney Stephenson, mercury and iodide failed until the administration of thyroid extract, which at once altered the appearance. This latter treatment might therefore be of use in this case.

Sarcoma of the Thyroid perforating the Trachea.

By D. R. PATERSON, M.D.

A FEMALE, aged 46, was admitted to hospital complaining of difficulty of breathing with swelling in front of neck for about six weeks. There was a considerable degree of dyspnoea with cyanosis. There was a flat, hard, painless swelling over the thyroid, and involving that organ. In the larynx the cords moved not very-freely, and in the subglottic region a greyish irregular mass was seen filling up the greater part of the tracheal lumen. Tracheotomy was performed under a local anæsthetic. The incision went through soft friable tissue, the trachea being found deeply placed, having been pushed towards the spine by the growth. A portion of tissue removed showed it to be a small round-celled sarcoma. Its complete removal was considered impossible. At the end of a fortnight the growth had invaded the skin wound, and pieces of growth were coughed up from time to time. The opening was kept patent by a rubber tube. The patient died suddenly in the night about a month after her admission to hospital.

The growth involved the thyroid gland and the neighbouring parts. The upper part of the trachea above the opening was filled with round masses of growth which had apparently perforated the anterior wall. Death had taken place by hæmorrhage escaping into the lungs from one of the intra-tracheal growths.

DISCUSSION.

MR. DE SANTI asked whether secondary growths had been found anywhere in this case. They were very rare, but recently he had had a case in which the patient died, and a large number of secondary growths were found in the intestine.

SIR FELIX SEMON alluded to the particular fact that both sarcoma and carcinoma of the thyroid gland when perforating into the trachea became pedunculated. That condition was marked in this case. He had recorded a similar case in the *Transactions of the Medico-Chirurgical Society*,¹ in which there was a huge tumour in the trachea, besides a small goitre. The case was seen by Sir Henry Butlin and others, in addition to himself. The patient, a lady, had great dyspnoea. He merely performed tracheotomy, because he

¹ *Med. Chir. Trans.*, 1893, lxxvi, pp. 375-90.

considered the case unsuitable for radical operation. She returned home to Huddersfield, and came back some months afterwards because she and her family doubted whether his diagnosis had been correct. When he saw her again, the tumour, which had been of the size of a small pear and almost filled the lumen of the tube, had completely disappeared, and there was no trace of a spot from which it had sprung. The late Sir William MacCormac endeavoured to perform a radical operation from without, and he succeeded in freeing the larger part of the enlarged thyroid so easily from the surrounding tissues, that in the first part of the operation the narrator questioned himself whether there had not been a diagnostic mistake. But when Sir William came to the central portion of the growth he found it was indissolubly connected with the trachea and could not be removed. Free hæmorrhage followed. The patient returned to Huddersfield, and died some time afterwards from uncontrollable bleeding from the trachea. The specimen was now at the College of Surgeons and everyone should see it, for there was a huge tumour in the trachea hanging from a very thin pedicle. Above it was a second pedicle without any actual growth attached to it. No doubt the first tumour, which Sir Henry Butlin and he had seen, hung down from a similar pedicle into the trachea, and either sloughed away or was swallowed or expectorated. The occurrence of a temporary disappearance of a tumour in such circumstances was so important for future observers, that he thought it was worth while to refer to the case again.

Dr. D. R. PATERSON, in reply, said there was one gland, the size of a pigeon's egg, in the mediastinum, and a small nodule showing round cells in the liver. In reference to Sir F. Semon's remarks, small pieces were expelled from time to time through the tracheotomy tube almost like bullets out of a gun; and considering the slenderness of their pedicle, it was quite feasible for a strong expulsive effort to clear the trachea for the time being.

Case of Laryngeal Stenosis.

By NOEL BARDSWELL, M.D.

F. A. M., AGED 28, admitted December 22, 1911.

Family history: None of tuberculosis.

Previous history: 1907—"laryngitis" for a week, otherwise good health.

History of present illness: Eighteen months ago—hoarseness, which got better; lungs pronounced clear. Three or four months—voice getting worse; some noisy breathing noticed for a few weeks.

Condition on admission: General condition favourable; temperature normal; pulse 100. Lungs: Signs suggesting pulmonary tuberculosis

at right apex. Larynx: Complete aphonia; no dysphagia; marked stridor. There is "beefy" infiltration invading the whole of both vocal cords, which overlap in anterior two-thirds; there is also infiltration deep in subglottic region. Glottic space reduced to 25 per cent. of normal (StClair Thomson, January 27, 1912). Sputum: Copious frothy sputum (three mugs daily). Tubercle bacilli not found.

January 28, 1912: Tracheotomy performed.

February 20, 1912: Wassermann reaction absolutely negative; temperature remains normal; pulse-rate reduced since tracheotomy to 84-88.

April 1: Diagnostic dose of tuberculin (A.F.) 0.0002 c.c. Neither local nor general reaction.

April 4: Tuberculin 0.001 c.c.—no effect.

April 9: Tuberculin 0.005 c.c.—temperature rose to 100.2° F. after thirty-six hours; slight headache and general malaise. Locally, no change in condition of larynx after the injection. Lungs: Slight suspicion of moisture at right apex, but no definite crepitations.

April 19: Sputum reduced very considerably and is now only about one-tenth of former quantity. Tuberculin (A.F.) 0.01 c.c.

April 20: Less stridor, no congestion in larynx, except over the shiny, beefy swelling, which replaces right vocal cord. Left vocal cord now clear and mobile, no ulceration. No local reaction after tuberculin (S.C.T.). Some general reaction, temperature up to 100.8° F.; malaise. Lungs: No evidence of local reaction; no increase of sputum.

DISCUSSION.

Sir FELIX SEMON said he did not think a diagnosis of its nature was possible. There was, no doubt, perichondritis from some cause, tuberculous, traumatic, or syphilitic, but there was nothing laryngoscopically to be seen except diffuse swelling of the parts and diminution of the lumen of the larynx.

Mr. HERBERT TILLEY asked whether there was any possibility of a foreign body, and if so, whether it would not be better to have a skiagram taken before doing any operation.

Dr. DUNDAS GRANT said the great fixation and infiltration indicated perichondritis. Possibly a small portion could be removed for examination. He showed before the Society several years ago a case very much like this, and there was, in that, enormous infiltration—apparently a new growth. But the portion removed showed simple inflammatory tissue. The case was now in the same condition as it was then.

The PRESIDENT (Dr. StClair Thomson) said the man was sent to a sanatorium, and he had to do an urgent tracheotomy. The beefy congestion was removed, but he was left with a narrow glottis. There was no proof that it was tuberculous, there was no temperature, and no positive evidence of syphilis. He wondered whether exploratory laryngo-fissure should be done.

**Malignant Disease of Pharynx and Tongue in a Man, aged 56.
Operation Two Years ago; no Recurrence.**

By NORMAN PATTERSON, F.R.C.S.

WHEN first seen (May 11, 1910) the patient complained of having suffered from stiffness of tongue for five months, and he could not move it to the left side of his mouth. No trouble in swallowing. He was losing weight. On right side of tongue far back there was an indurated mass which extended on to the floor of the mouth, and mucous membrane over the lower jaw. It also involved the anterior pillar of the fauces. Microscopical report: Epithelial carcinoma rapidly growing. The stumps of several carious teeth were removed.

May 18: Ligature of right external carotid—no enlarged glands discoverable. Tracheotomy.

May 23: Right cheek split back to masseter. Tongue drawn out by silk stitch. Most of posterior portion of tongue removed on the right side well wide of the growth, and the dissection continued so as to include a portion of floor of mouth and mucous membrane over angle of jaw. The mass removed included also the pillars of the fauces and tonsil. Subsequently the parts were brought together with catgut sutures. On account of the preliminary ligature of external carotid there was very little hæmorrhage.

The patient made an excellent recovery.

Case of Tuberculous Ulceration of the Larynx.

By G. SECCOMBE HETT, F.R.C.S.

MALE, aged 20, admitted to Mount Vernon Hospital on April 29, 1911, complaining of cough, expectoration, dyspnœa, and the feeling of a lump in the throat of five months' duration. The ventricular bands were infiltrated, the right being occupied by a large ulcer; both cords

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were infiltrated and ulcerated. There were very extensive signs in the chest—practically universal. There was a cavity in the upper lobe of the right lung. Tubercle bacilli in sputum. The patient was admitted with a swinging temperature which became normal after ten days' in-patient treatment. The larynx was treated locally. The condition of the larynx is now arrested, although there are extensive signs in the chest.

Case of Laryngo-fissure for Intrinsic Carcinoma.

By G. SECCOMBE HETT, F.R.C.S.

MAN, aged 54. A laryngo-fissure performed for intrinsic carcinoma involving the left vocal cord. The left cord and portion of the arytaenoid removed, together with the anterior sixth of the right cord as the growth was encroaching on the anterior commissure. It is proposed to give the patient a course of exercises for the re-education of the voice.

DISCUSSION.

Mr. HERBERT TILLEY said this was a private patient of his on whom he had arranged to operate, but owing to an illness Mr. Hett operated for him. The patient made an excellent recovery, and there was no sign of recurrence. He had asked Mr. Hett to make a very free removal, and he did so. There was great loss of voice, and the case was brought now to see if anything could be done to improve it.

Mr. HARMER did not see why the patient should not have a course of voice training, especially as he was not using to the full extent the means he had. He had seen cases as bad which, after a prolonged course of treatment, had considerably improved.

Dr. H. J. DAVIS said that at the March meeting¹ he showed a case of double abductor paralysis, from which he proposed to remove the arytaenoid cord and ventricular band, but he was advised not to do it because the subsequent adhesions would make the patient worse. But there were no adhesions here, and he saw no reason why they should have necessarily formed in his case.

The PRESIDENT said that the quality of voice to be expected after laryngo-fissure seemed to be uncertain, and one could not very well predict it. Moreover, some patients used their powers to the best advantage, employing the resonators better than others. He had seen the voice much improved by exercises.

¹ *Proceedings*, p. 94.

Sir FELIX SEMON, in reply to Dr. Davis, pointed out that in this present case the disease had been very extensive, more so than one found in abductor paralysis, and that a good deal of tissue had to be cut away, including much of the thyroid cartilage in front, in order to safeguard against a recurrence. That made the case quite unlike one of bilateral abductor paralysis, so far as operative prospects were concerned.

Case of Tuberculous Infiltration of the Larynx.

By G. SECCOMBE HETT, F.R.C.S.

MALE, aged 34. Symptoms: Cough and hoarseness. Physical signs in larynx. Infiltration of right vocal process and posterior half of right cord, with some interarytænoid pachydermia and swelling of the arytænoid. Signs of disease throughout left chest. Tubercle bacilli in sputum. Admitted on February 18 to Mount Vernon Hospital. Larynx—condition satisfactory.

Case of Cyst of the Right Vocal Cord.

By G. SECCOMBE HETT, F.R.C.S.

FEMALE, aged 54. Cyst of right ventricle, shown at the February meeting.¹ Symptoms then, hoarseness for twelve years. The cyst has been removed with Patterson's forceps by the direct method. Patient says that her hoarseness is no better.

Mr. HERBERT TILLEY said that three or four weeks ago he removed a cyst of the ventricle by the direct method. This was done because she was too nervous for removal by the indirect method, even after applying 20 per cent. cocaine. There was no return of the cyst, and the vocal cords were only slightly congested. He believed that if she had nitrate of silver applied to the cords, and faradism to the larynx, she would get a much better voice.

¹ See *Proceedings*, p. 91.

**Section of a Papilloma removed from the Free Border of the
Left Inferior Turbinal at the Junction of the Posterior and
Middle Thirds.**

By A. R. TWEEDIE, F.R.C.S.

THE specimen is from a young woman who recently came to my out-patient department at the hospital, complaining of nasal obstruction and asthma. Apart from this papilloma the left side was fairly roomy, but the right side was much impaired by an enlargement of the anterior ends of both lower turbinals combined with a septal spur, and the whole nose was in that state associated with chronic rhinorrhœa. There was nothing abnormal in the nasopharynx or ears.

Guillotine for Enucleation of Tonsils by Sluder's Method.

By THOMAS GUTHRIE, F.R.C.S.

MR. THOMAS GUTHRIE had devised this guillotine in order to facilitate enucleation of the tonsils by the method first described by Dr. Greenfield Sluder, of St. Louis, before the American Medical Association, on July 2, 1910.¹ The important feature of this method was that advantage was taken of an anatomical prominence on the lower jaw—the “*eminentia alveolaris*”—to press the tonsil through the ring of the guillotine. As the distal surface of the ring was applied over the tonsil instead of the proximal—as in the ordinary method—he had had the blade of the guillotine reversed on its long axis, so that its bevelled surface tended to dislocate the tonsil from its bed. The whole instrument had been made very strong so as to resist the considerable pressure required. The handle had been devised so as to provide the maximum leverage. The arrangement by which the parts of the instrument could be separated for purposes of cleansing had been adopted from the guillotine devised by Mr. Hugh Jones.

DISCUSSION.

Dr. VINRACE asked what special advantage was claimed for this instrument over that possessed by the Mackenzie guillotine. One could reverse the handle in the latter, and get the same advantages.

¹ *Journ. Amer. Med. Assoc.*, 1910, lv, p. 60.

Dr. H. J. DAVIS considered that all guillotines were made much too thick at the end; if the cutting ends were finer, more of the tonsil would be cut off. The method of removing tonsils practised by Mr. Harrison, of Newcastle, he regarded as an improvement on Sluder's method. It must be remembered that by using excessive digital pressure one could button-hole the anterior pillar by pressing it together with the tonsil into the ring of the tonsillotome, and it was easy to injure it in this way.

Mr. WESTMACOTT said it was difficult to understand why this instrument should be better than Matthieu's ring guillotine, as the latter would go in between the anterior and posterior pillars and remove the tonsil without injuring the pillars.

Dr. KELSON said that Dr. H. J. Davis's statement that pieces might be punched out of the anterior pillars of the fauces with the tonsillotome might throw a light on certain cases of perforation of these pillars, the origin of which had been much debated. He also considered that it might be concluded from the number and variety of instruments brought forward that the removal of tonsils was one of the most difficult operations in surgery, and he asked whether any ordinary guillotine did not suffice for getting out a tonsil in fairly capable hands.

Dr. MIDDLEMASS HUNT said he had seen Mr. Guthrie use the instrument in a number of cases, and with it he removed the whole tonsil and capsule much better than with the French guillotine, which he (the speaker) had used for many years.

Mr. GUTHRIE replied that he did not claim anything original for it, but he thought the shape of the handle would make it easy to get tonsils out by the method. As a rule the tonsil was removed in one piece.

Case of Laryngeal Stenosis.

By CYRIL HORSFORD, F.R.C.S.

PATIENT, a man, aged 40. Gradually increasing shortness of breath and weakness of voice during the past five or six years. Symptoms have progressed more rapidly during the past twelve months. History of syphilis contracted sixteen years ago. Larynx shows well-marked signs of gummatous infiltration and contraction of all the tissues of the larynx as far as can be seen. Has been under treatment for three weeks and is improving greatly under potassium iodide internally and mercurial inunctions.

Epignathus or Teratoid Tumour of the Nasal Septum and Base of the Skull.

By G. J. JENKINS, F.R.C.S.

FEMALE child, aged 1½. A teratoid tumour occupies and fills up the cleft of a cleft palate condition which involves the whole of the soft and posterior half of the hard palate. By the fissure on either side of the tumour a fine probe may be passed up into the nasal cavity, and the tumour is free posteriorly, but anteriorly the mucous membrane of the tumour is continuous with that on the premaxillary portion of the palate. The mucous membrane covering the anterior part of the buccal surface of the tumour has the characters of the membrane of the hard palate, but about the middle of this surface there is a projecting tooth with a crown like an irregular molar, surrounded by a membrane like that of the alveolar gum. A probe can be passed on either side of the tumour from the anterior nares into the pharynx.

There is a coloboma of the iris; fundus of the eye is normal. No other deformity. The eyes are remarkably far apart and the face very broad. The patient is rickety. Teeth eruption began one month ago; tooth of tumour came first.

The child is very happy, and there is no sign of mental defect so far. Takes food well, without regurgitation. Snores very badly when sleeping, and often has bronchitis.

A Patient who wore a Tracheotomy Tube for Fifty Years.

By STCLAIR THOMSON, M.D.

A TRACHEOTOMY tube was shown which had been worn by one patient, on and off, for sixteen years. Frequently the tube was not changed more than once in two years. Altogether the patient had worn a tracheotomy tube for over fifty years. Her case had been published in a brief note by Dr. Berridge in the *British Medical Journal*.¹ The record was so interesting that Dr. StClair Thomson had written for these particulars to Dr. Berridge, who in reply also stated that the

¹ *Brit. Med. Journ.*, 1912, i, p. 816.

patient did not suffer from bronchitis more than other people, and that she died of senile decay at the age of 81.

While we are all agreed as to the value of nasal respiration, this case shows that Nature is full of wonderful compensations, and that in certain cases of laryngeal stenosis it may be wiser to put up with a tracheotomy tube than risk uncertain operations with the object of being able to do without a cannula. This case was referred to in view of the discussion at the last meeting of the wearing of a tracheotomy tube by patients with double abductor paralysis.

DISCUSSION.

Mr. DE SANTI said he knew a man who wore a tracheotomy tube for seventeen years. He was in the habit of driving a coach in all weathers; he did not change the tube very often.

Dr. DAN MCKENZIE referred to a very old man who was in the habit of coming once a month to the Central Throat and Ear Hospital to have his tube cleaned, and who had his tracheotomy done sixteen years ago, for, it was said, malignant disease. The disease in the larynx, whatever it was, had now disappeared, and he could breathe in the ordinary way. On one occasion the speaker removed the tube and tried to induce the patient to do without it, but he became so excited and terrified that the tube had to be replaced.

Mr. MARK HOVELL said that until two years ago he saw from time to time a man on whom he performed tracheotomy at Golden Square Throat Hospital in the summer of 1878, thirty-four years ago.

Sir FELIX SEMON said he could corroborate the statement that tracheotomy tubes could be worn, and safely, for an almost indefinite time without fear of bronchitis. He could also support the statement as to the abject fear of some patients when the tube was removed. Members would remember an extraordinary case of soft fibroma of the larynx and neck which he had brought forward, and in which he had removed the growth without opening the laryngeal cavity. For several years the patient could not be got to agree to any operation, not because she was afraid of the operation itself, but because her tube was, of course, to be removed, and because she feared living without this tube, which she had had in her throat for twelve years. She was now quite well.

Dr. DUNDAS GRANT said he was much struck by the case of a girl, aged 21, who had worn a tracheotomy tube continuously since early childhood on account of a huge papilloma which blocked the larynx. He removed the tube and the papilloma, and it was surprising to see the joy with which she drew a breath of air through her nose, and smelt a flower, which she had not done during all the years of wearing the tube. Breathing through the nose was a great source of enjoyment as well as safety, and it was important that a patient should do without the tracheotomy tube if possible.

Specific Ulceration of the Tongue, Nasal Septum and Larynx.

By ANDREW WYLIE, M.D.

MAN, aged 41, an engineer, complaining of hoarseness and slight difficulty in swallowing. There is a hard patch on the centre of the tongue, a deep fissure with ulcerated, ragged edges. The septum is swollen, with a ragged ulcer on the left side. In the larynx there is a marked swelling on the left ventricular band covering the left vocal cord. No cough, no spit. Wassermann's test has not yet been taken. Patient has a history of specific disease. The hard patch on the tongue at the seat of ulceration points to malignant disease. A piece has not yet been removed for microscopic examination.

DISCUSSION.

Dr. WYLIE added that the point of interest in the case was the hardness of the ulceration, pointing to malignant disease, although all the other symptoms showed specific disease.

Mr. DE SANTI thought there should be an operation on the tongue as a preventive measure against the onset of carcinoma, as advised and carried out by the late Sir Henry Butlin and others.

Dr. DUNDAS GRANT considered that Dr. Wylie's suspicion was well grounded; indeed, he thought malignant transformation had already set in.

Mr. HERBERT TILLEY referred to Sir Malcolm Morris's recent paper¹ containing illustrations of chronic syphilitic tongues, and their improvement after treatment by salvarsan. That remedy might be tried here.

Dr. H. J. DAVIS pointed out that there was also disease in the tongue and larynx, which seemed to contra-indicate an operation on the tongue. Syphilitic tongues were often made to clear up by painting with sufficiently strong chromic acid; he used a strength up to 40 per cent. It removed the pain, and coated the tongue with an albuminate, which enabled the patients to eat with greater comfort. He had applied this strength to tubercular ulcerations on the tongue and mouth with great benefit.

¹ *Brit. Med. Journ.*, 1912, i, p. 712.

Case of Fixation of the Left Half of the Larynx in a Woman.

By H. FITZGERALD POWELL, M.D., and L. COLLEDGE, M.B.

THE patient is a married woman, aged 58. She complains of hoarseness, which she has noticed for about seven weeks and which has not been getting better or worse. She has no pain nor other symptom. Her general health is good, with the exception that she has a cough. The left half of the larynx is quite immobile. The left vocal cord is a little red and swollen compared with the right one. The pupils are active to light and accommodation, but the left is much smaller than the right. There are some dilated veins on the left side of the neck. Examination of the chest reveals nothing abnormal. A skiagram of the chest is suggestive of the presence of enlarged mediastinal glands. There is no luetic history. Examination of the sputum for tubercle bacilli is negative.

Skiagrams illustrating the Treatment of Two Cases of Non-malignant Stricture of Gullet by Endo-oesophageal Mechanical Dilatation.

By WILLIAM HILL, M.D.

Case I.—A male, aged 31, suffered from a large general dilatation of the œsophagus above a phreno-cardiac stricture, which was well brought out in the skiagram. After endoscopic bougieing and dilatation with Brünings's dilator the bismuth paste was a week later seen to pass slowly in bulk through the now fairly open cardia, and the dilatation appeared to be reduced one-third in diameter.

Case II.—A female, aged 60, with a cicatricial stricture 2 in. above the diaphragm, was similarly treated, and the bismuth paste, which was long held up before treatment, after dilatation passed fairly freely down, and was not "held up" for any time, when examined three weeks later.

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CASE I.—Before.



Skiagram taken by Dr. Finzi two minutes after swallowing bismuth paste; the bismuth is "held up" above the narrow phrenocardiac stricture. (Reduced $\frac{1}{2}$.)

CASE I.—After.



After dilatation a week previously. Skiagram taken two minutes after swallowing bismuth paste; the latter is seen passing slowly but freely through the cardia. (Reduced $\frac{1}{2}$.)

CASE II.—Before.



Skiagram taken two minutes after swallowing bismuth paste; the latter is "held up" in the dilated gullet. (Reduced $\frac{1}{2}$.)

CASE II.—After.

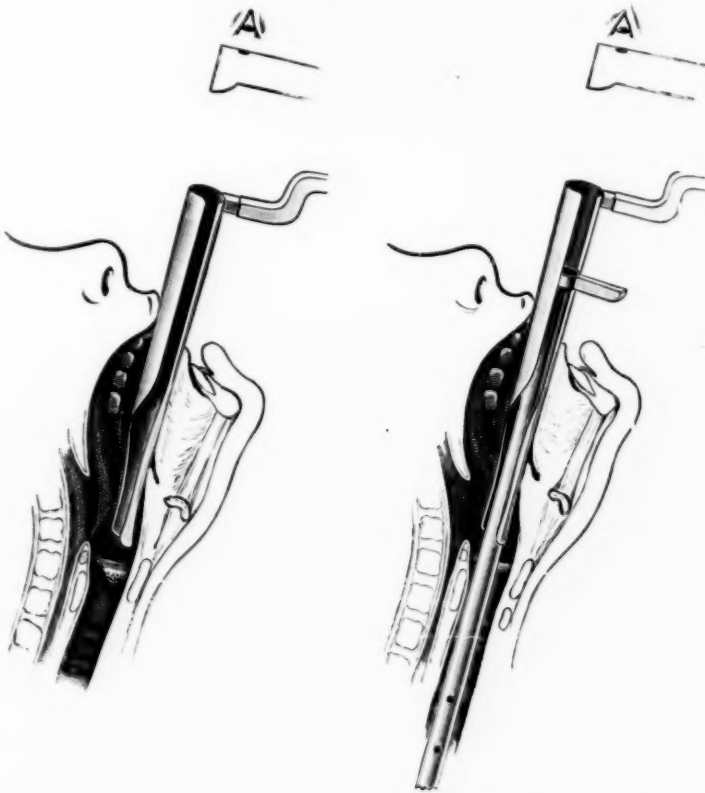


Three weeks after dilating stricture. Skiagram taken two minutes after swallowing bismuth paste; the latter passed freely down without bulging above the strictured region. (Reduced $\frac{1}{2}$.)

Instruments to facilitate Per-oral Tracheo-bronchoscopy.

By WILLIAM HILL, M.D.

THE left-hand figure shows the exhibitor's large funnel-shaped endoscope for the larynx and pharynx in the laryngeal vestibule of a child, aged 10. The lateral slot not only permits of binocular vision and easy



instrumentation when operating on the larynx, but it also facilitates the rapid passage of a tracheoscope or bronchoscope in cases where—

(1) There is dyspnoea from spasm, &c., during operations on the larynx, more especially in children.

(2) For *per-oral* tracheo-bronchoscopic explorations where there is difficulty or delay in finding the "sphinctered" laryngeal vestibule, more especially when working with a narrow bronchoscope alone in children.

(3) To relieve at once, without resorting to tracheotomy, the temporary spasmodic dyspnoea which sometimes supervenes on administering an anæsthetic in cases of laryngeal and tracheal obstruction.

A tracheo-bronchoscopic tube is shown in the right-hand figure within the slotted laryngoscope, and it differs only from a Killian tube in that the proximal end of the instrument is a little less thick to admit of its easy passage through the laryngoscope, and the distal extremity (not shown in the diagram) is slightly bevelled to facilitate its passage through the spasmodically closed glottis and if possible to avoid the use of a guide, which Killian often finds necessary with his non-bevel-ended tubes. The adult-size slotted laryngoscope shown has been successfully employed by the author in quite young children for laryngeal operations, as well as to facilitate tracheo-bronchoscopy.

Bilateral Œdema of the Ethmoidal Septum in Sinus Suppuration.

By DAN MCKENZIE, M.D.

THE patient is a young man who has only recently come under the exhibitor's care. He is shown to illustrate the type of septal œdema to which allusion was made at a recent meeting of this Section. The ethmoidal portion of the nasal septum on both sides presents a smooth, rounded, and boggy swelling, which on the right side is so considerable as to occupy the whole of the upper meatus of the nose. Microscopical examination by Dr. Wyatt Wingrave shows that the swelling is due to simple inflammatory œdema. Why do polypi not form?

MR. DE SANTI considered the diagnosis correct. He had shown a similar case in which he thought the patient was suffering from either hæmatoma or gummatous deposit, but some of the members criticized that diagnosis and considered it was chronic inflammation. The patient was treated on that idea and got well.

Bony Growth of the Nose and Nasopharynx.

By MIDDLEMASS HUNT, M.B.

THE patient, a female, aged 44, presented herself at the Royal Infirmary, Liverpool, on Monday last, April 29, complaining of increasing nasal obstruction of six months' duration, accompanied by diffuse headache, pains in the back of neck, and loss of sense of smell. On anterior rhinoscopy the posterior part of the right nasal passage was seen to be blocked by a smooth, pale pinkish growth attached by a broad base to the upper part of the septum. On the left side there was a diffuse elevation, or deviation, of the septum corresponding to situation of the growth on the right side. On posterior rhinoscopy both choanæ were seen to be filled with growth which hid the upper part of the septum and projected slightly into the nasopharynx. The colour of the growth in this situation varied from pale grey to slaty blue. On palpation the growth presented a bony hardness. There were no enlarged glands, no hæmorrhage or deformity, but malignancy was suggested by the clinical history of the case. Opinions were invited as to the nature of the growth and the best method of removal.

DISCUSSION.

Mr. DE SANTI considered that one could not diagnose it without removing a portion. The rapidity of the growth was in favour of the diagnosis of osteosarcoma. It should be operated upon, though the procedure would have to be an extensive one, either through the mouth by splitting the palate, or from the front and letting the nose down, or a combination of the two. It might even be necessary to detach the whole of the upper jaw.

The PRESIDENT considered that these growths could be reached by an enlarged Rouge's operation, or a Moure's operation, going through the upper part of the ethmoid and antrum. This would bring the operator nearer the growth, and there would be less hæmorrhage than by turning down the nose.

Mr. HERBERT TILLEY thought a favourable feature in the case was that the growth did not project into the nasopharynx. One could feel the surface of the growth in the right posterior choana, and there was no protrusion of the eye. He had had two such cases: one a chondro-sarcoma, which recurred, and he expected the patient was now dead; the other case was an osteosarcoma. He agreed with what the President said as to the method of

operation, and there would be an ample view of the growth by making a long incision along the junction of the gum with the cheeks and turning up the soft parts of the face. But the anaesthetist must not use a gag or pull out the tongue, for that would stretch the face down. The operator must put in a laryngotomy tube, plug the lower part of the pharynx, and anaesthetize through the laryngotomy tube. In this particular case tight plugging of the nasopharynx might alone be sufficient.

Dr. WATSON-WILLIAMS said the advantages of approaching by the method mentioned by Mr. Tilley were mainly for growths involving the maxillary antrum and which did not extend high up into the ethmoid. It was undesirable to abandon the higher route, and when dealing with sarcoma the question of leaving a scar was of secondary importance to that of thorough operation. He advocated an osteoplastic operation from above, to clear out the ethmoidal cells, by the method he had described by the external route.¹

Dr. MIDDLEMASS HUNT, in reply, said the case was unique in his experience. It was remarkable for the rapidity with which the nasal obstruction had increased and the intense hardness of the growth. From the clinical history he did not think it was an osteoma, and it did not accord with the description of osteomata found in the text-books. He thought it must be malignant, probably osteo-sarcoma. He thought it could be reached by Rouge's method, but he was not certain about the relation of the upper part of the growth to the base of the sphenoid. There were no symptoms except pain in neck and loss of sense of smell.

¹ Vide *Proceedings*, 1908, i, p. 116.

Laryngological Section.

June 7, 1912.

Dr. STCLAIR THOMSON, President of the Section, in the Chair.

Four Cases illustrating Disease of the Sphenoidal Sinus.

By STCLAIR THOMSON, M.D.

Case I.—Miss B. This lady was operated on in January, 1909 (three years ago), for suppuration of some ten years' standing in all the accessory sinuses of both sides, with the exception of both frontals. She had suffered considerably from her eyes. Very persevering after-treatment was required in order to secure complete arrest of the sphenoidal suppuration, but for the last year and a half she has remained quite clear, except for an occasional small crust from the left ethmoid region. The ostium of the left sphenoidal sinus has somewhat contracted, but is still open, and free from any pus. The right sphenoidal sinus is widely open. Over this opening two large posterior ethmoidal cells are easily seen.

Case II.—Miss L. This lady came under my observation in 1908 complaining of chronic and severe pain over and through the left eye. From this she had suffered for six or seven years, and had consulted many ophthalmic surgeons both at home and abroad. One of these suggested an exploration of the sinuses, although she had never had other localizing symptoms than an occasional yellow post-nasal discharge. It was therefore more as an exploration that the left mid-turbinal was removed and a large posterior ethmoidal cell opened. This contained a large collapsed polypus. Further ethmoidal cells were opened at subsequent sittings, and both sphenoidals were opened—all

under cocaine. There was some muco-pus in both sphenoids. For two years both sphenoidal sinuses have been absolutely healthy. It will be seen that the right one is widely opened, but that the ostium of the left is contracted by cicatrix. This opening into the left posterior ethmoidal cell can be seen. The patient has been greatly relieved and has been able to use her eyes again, but she still suffers from tenderness under the left orbit, and from a post-nasal discharge which cannot be located. Radiographs are exhibited which were used in locating the posterior ethmoidal cells and sphenoidal sinuses. She has seen several distinguished colleagues in consultation, but we have not been able to locate and cure this discharge. If not a simple nasopharyngitis it must originate in some posterior ethmoidal cell.

Case III.—Mrs. S. W. This patient has previously been shown before the Section in connexion with a discussion on frontal sinus operation.¹ She is now shown again to illustrate the permanence of the opening of the sphenoidal sinus. She had suffered so intensely from headaches that she had first sought admission to the Queen Square Hospital. These headaches recurred in spite of operations on the frontal, ethmoidal, and maxillary sinuses on the right side, and it was then that her sphenoidal sinus was opened and found to contain pus. The cure of this unilateral pansinusitis has remained quite permanent for some years.

Case IV.—This lady has been under observation since March, 1908. She has had several operations on the left sphenoid, ethmoid, and maxillary sinus. The left sphenoidal ostium has been widely opened and the cavity has done well. But the patient for some years was greatly troubled by crust formation over the ethmoid region, and round the antro-nasal opening. For this she was taken in consultation to Professor von Eicken and Mr. Tilley. She also had vaccine treatment in 1909. The crust formation continued right up until spring of this year, in spite of long and persevering local medicines. In April last, just as it had been decided to start her on another course of vaccine treatment, the crust formation entirely ceased. There is now a little muco-pus from the ethmoid region, but the other sinuses on the left side remain quite cured.

¹ *Proceedings*, iv, p. 123.

DISCUSSION.

Dr. WATSON-WILLIAMS said the first patient was to be congratulated on the result in her nose, as both sides were free from discharge, although the ostium of the left sphenoidal sinus was contracted. It was noteworthy that even if the sphenoidal sinus was kept open, in some cases the result was not good, while in others, although the sinus had almost closed up again, the "cure" apparently persisted. There seemed to be no definite relationship between the size of the opening of the sinus and the result achieved.

Dr. FITZGERALD POWELL congratulated the President on the result of the first case, it was the best result he had ever seen from the sphenoidal sinus operation. But with regard to the other cases that were shown, he could not say the same, and this included his own case. It appeared to him that in most of the cases there was some pus or muco-pus in the nose or nasopharynx, and in all that he had questioned, the pain had not entirely disappeared in the head. In his own case there was still some pus, but the headache, especially at the occiput and back of the neck, had gone. In looking for a cause for this he had come to the conclusion that the openings were not free enough and did not extend low enough down to ensure dependent drainage. He considered the lower down in the anterior inferior wall the opening was made the better would be the results.

Mr. WAGGETT, referring to the question of keeping the opening widely free, asked what experience the President had had in the use of the chisel in removing the lower part of the anterior wall where it was too thick to be attacked with the punch forceps. The question of danger of the spread of osteomyelitis had to be considered.

Mr. HERBERT TILLEY said he had used a long chisel for removing the lower portion of the sphenoidal sinus. He did not think there was much danger in its use if one inspected the field of operation from time to time.

Dr. DAN MCKENZIE asked whether there was any means of shortening the period of chronic infection where a large dependent opening had been made and yet the discharge and formation of crusts still persisted. He took it that it was the rule to have such a period after nasal sinus suppuration. His experience led him to believe that in course of time this discharge naturally ceased and cure occurred. That time might, however, extend to two or three years.

Dr. WATSON-WILLIAMS asked whether in Case II the antrum had been operated upon. In one of his own cases he had had a similar experience to that of the President in Case III, only the other way about. He recalled a case of sphenoidal sinus suppuration in which he believed he had got to the

bottom of the mischief, and when probing the sphenoidal sinus after opening it the patient would complain that probing caused pain in the forehead. Again, cases which at first seemed to be frontal sinus suppuration showed later that they were sphenoidal suppurations and vice versa. He had had a case of sphenoidal suppuration which did not clear up, and the increasing local tenderness and redness led to the opening of the frontal sinus, when it was found that there was a frontal sinusitis. He thought the continuance of a suppurating focus in other sinuses or cavities might be the cause of persistence of secretion in a cavity which had been opened and which had improved, but only up to a certain point. As the question of opening the floor of the sinus had been touched on, he exhibited forceps for the removal of the floor of the sphenoidal sinus in cases in which, owing to the size of the sinus, it was thought a sufficiently free opening could not be obtained through the wall. There was a great tendency for the sphenoidal sinus cavity to close. And in the case of a small sphenoidal sinus when the anterior wall and a portion of the floor had been removed and there was a persistent tendency to close, he had found that removal of the posterior portion of the vomer corresponding to the septum of the sphenoidal sinus, with the septum of the sinus, throwing both cavities into one, was sufficient to ensure persistent patency of the sphenoidal sinus. He did not advocate it as a matter of routine, but mainly for those cases to which he had alluded as suitable for this sphenoidal sinus septectomy.

Mr. HARMER asked whether the bacteriology of Case II had been investigated, as the nature of the crusts was interesting. It might be found to be some form of paratyphoid infection. Case IV raised the important point that although some of these cases of sinus disease seemed as if nothing more could be done for them, they sometimes cured themselves in course of time. A patient had recently been attending St. Bartholomew's Hospital on whom there had been several operations during the last twelve months without improvement; now she was quite free from discharge.

Mr. HERBERT TILLEY thought the President could do no more in Case II than he had done. It was practically impossible to say where the pus came from. If the patient had not declared that pus came away in the mornings, he would have said it was a perfect result of operative interference. There was no discharge when he saw her, and he would like to know whether the President had examined her in the mornings between nine and ten. There seemed to be a distinct neurasthenic element in the case. Her neuralgia was not necessarily due to the asserted suppuration at all; it might be caused by adhesions, or it might be a neuritis of the supra-orbital nerve without reference to disease in the underlying frontal sinus. He did not advocate further operation, but suggested a vaccine, or even treatment by suggestion.

Dr. VINRACE asked whether any refractive changes in the eyes had been noticed, particularly of one eye, coincidental with sphenoidal sinus disease. He believed that such changes might result.

Mr. DE SANTI said one of Dr. StClair Thomson's cases reminded him of a patient in whom the diagnosis was difficult. There were intense headaches, occipital chiefly, with pain about the left side of the nose, and the patient's mind was affected. She had enormous proptosis of the eye, and as the ophthalmic surgeon suspected sinus suppuration she was sent to him (Mr. de Santi). There was some rather thick, yellow, crusty discharge at the back of the nasopharynx. Careful examination revealed a slight swelling of the middle turbinal, but he could not see any pus in the nasal cavities. He could not get a view high up. There was no evidence of disease in the frontal or other accessory sinuses. He concluded that the symptoms were not due to sphenoidal sinus trouble, and that the patient probably had cerebral tumour. Nothing was done to the nose, and two months afterwards the woman died. Post mortem, there was found to be a large sarcoma of the frontal lobe of the brain, which had invaded the orbit, and caused the proptosis and intense headache and pain over the nose. The headaches, pain over the nose, crusty discharge in the nasopharynx, and the eye symptoms were suggestive of sphenoidal sinus mischief, and made the diagnosis difficult. He had had three or four cases which proved fatal, in which there was tertiary syphilis with extensive necrosis and sequestra, and in which no operation would have been possible.

Mr. CYRIL HORSFORD said Case III reminded him of a similar case, in which there were such severe headaches that the patient was admitted to Queen Square Hospital, and operated upon for cerebral tumour; at the operation, however, no tumour was found. Two or three years later the patient was sent to him, and he found that two or three sinuses were affected. The middle turbinal was intact; he could not see whether the sphenoidal sinus was involved. From the history given by the neurologist who saw the case it appeared to be sphenoidal sinus infection. It would have been possible to explore that sinus at the time of the operation on the patient. He opened the ethmoidal sinus and the antra, and found them diseased. The headache had now disappeared. This illustrated the difficulty in diagnosis. It was most important to be able to diagnose disease of the sphenoidal sinus at an early stage, particularly in cases where the disease appeared to be limited to the sphenoidal sinus. He asked whether it was possible to get at and treat the sphenoidal sinus without removing the middle turbinate. He thought by so doing there was a risk of infecting the ethmoidal region, which was a serious matter.

Dr. KELSON asked whether the President had ever operated upon the sphenoidal sinus in a case of fetid atrophic rhinitis. Mention had been made of large crusts and oyster-shell-like masses which made one think of this disease. Clinically the cases seemed divisible into two great groups commonly met with: (a) the ordinary suppurating sinus; (b) those in which there were large crusts with a peculiar offensive odour—ozæna. Many of these latter Grünwald claimed could be cured by operating on the sphenoidal sinus, but they must not be confused with each other.

The PRESIDENT (Dr. StClair Thomson), in reply, said he regarded the sphenoidal sinus as one of the most satisfactory to deal with. He had not had, nor heard of, a case of death from operation on the sphenoidal sinus; but in the *Transactions of the Medical Society of London*¹ he had published two cases which occurred in his own practice where death resulted from untreated sphenoidal sinus disease. The satisfactory results were obtained in some cases by repeated operation, and in others by leaving the patient alone. The treatment had to be both prolonged and intermittent, and he agreed with the member who said that too much local interference did not seem to be good for all these cases; periods of rest must be given to allow the mucosa to settle down. After opening the sinus he usually recommended the patient to go into the country for three weeks. Afterwards he further enlarged the opening, and if necessary enlarged it yet again. He found a difficulty in getting away the lower bony part. He had been afraid of chisels slipping on to the thin part of the back. He regretted that he had never used the electric burr. In addition to opening the sinus he washed it out, wiped it with peroxide of hydrogen, and applied silver and argyrol plugs for twelve or twenty-four hours. He had never curetted the inside of a sphenoidal sinus. One patient, an actor, whose case had been his despair, and who was very neurasthenic, got a part to play in America, and when he had been at sea three days the condition disappeared! In Case II he had repeatedly examined the patient in the morning; he had never seen pus in her nose, but he had seen muco-pus on the roof of her nasopharynx, always in the midline, such as occurred in many people when the ethmoid had been removed. On one occasion a case of malignant growth of the pituitary body was sent to him as probably a sphenoidal case, but skiagrams showed malignant growth of the pituitary body, from which the patient died. In former years he had opened the sphenoidal sinus on account of ozæna, but he thought this made it worse. The ostium would often close from swelling of the mucosa round the lips. Contraction of the orifice by means of healthy scar tissue he regarded as favourable. He had not had a case of osteomyelitis. He had had numerous cases in which the associated eye symptoms were undoubted, not only from their presence, but also from their disappearance.

¹ *Trans. Med. Soc. Lond.*, 1906, xxix, pp. 14-21.

Demonstration of Exhibits illustrating Disease of the
Sphenoidal Sinus.

By P. WATSON-WILLIAMS, M.D.

- (1) *Some instruments formerly in use for sphenoidal sinusitis.*
 - (a) Aspirating needle and trocar used in 1896.
 - (b) Cone-shaped trephine used for opening sphenoidal sinus in February, 1897.
 - (c) Sphenoidal sinus-cutting forceps, 1898.
- (2) *Dr. Watson-Williams's instruments now used in sphenoidal sinusitis.*
 - (a) Sphenoidal sinus exploring syringe with blunt trocar and cannula.
It can be used without previous removal of any portion of the turbinals.
 - (b) Small sphenoidal sinus and ethmoid-cutting forceps. For removing the anterior wall of the sinus and the posterior ethmoidal cells.
 - (c) Large sphenoidal sinus-cutting forceps.
 - (d) Cutting forceps for removing the sphenoidal sinus floor.
- (3) *Diagrams showing (a) sphenoidal sinus-exploring cannula in situ ;
(b) small cutting forceps removing the anterior sinus wall.*
- (4) *Specimen of polypi removed from sphenoidal sinus and stereogram showing polypus growing from sphenoidal sinus (Zuckerkandl).*

- (5) *Drawing (see figure) showing the exhibitor's method of removing the sphenoidal sinus septum and the posterior half-inch of the corresponding part of the nasal septum—sphenoidal septectomy—for double sphenoidal sinus suppuration.*

(The operation is reserved for cases where both the sphenoidal sinuses, having been opened previously, tend to close up.)

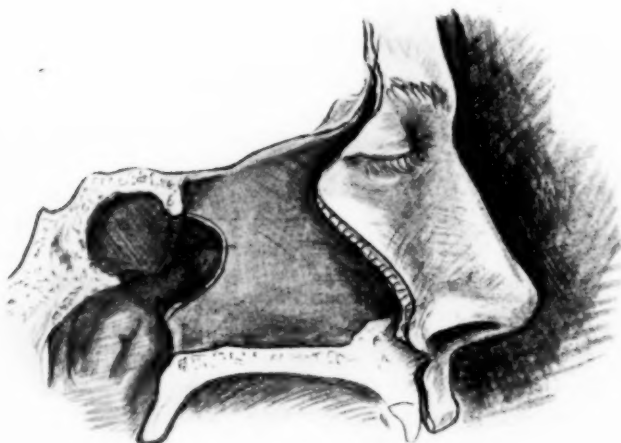


Diagram to illustrate removal of the sphenoidal sinus septum and corresponding half-inch of nasal septum. The anterior wall and part of floor of sphenoidal sinuses also removed, forming one large cavity.

- (6) *Stereogram showing the sphenoidal sinus extending back to the foramen magnum (Zuckerkandl).*
- (7) *Plates showing the optic canal in relationship with the sphenoidal sinuses.*
- (8) *Stereoscopic skiagrams of the sphenoidal sinuses.*
- (9) *Skiagrams showing probes in the sphenoidal sinuses of patients.*
- (10) *Charts of the visual fields in sphenoidal sinusitis.*
- (11) *Photograph of case dying with cavernous sinus thrombosis from sphenoidal sinus suppuration.*

**Lateral Skiagram of Skull showing Sphenoidal Sinus and
Sella Turcica.**

By HERBERT TILLEY, F.R.C.S.

THE case showed how excellently the depth of the frontal sinuses could be seen by means of a skiagram (*see figure*). The patient had double optic neuritis, for which the cause could not be found. There



Skiagram of normal sphenoidal sinus (from a case in which sphenoidal sinus or pituitary disease was suspected).

was no suppuration in the sphenoidal sinus, and it was thought possible that a pituitary tumour might be pressing on the optic nerve, but the sella turcica was clear.

Unilateral Atrophic Rhinitis in which the Ostium of the Right Sphenoidal Sinus is well seen.

By HERBERT TILLEY, F.R.C.S.

MISS D'A., aged 46, has suffered from "nasal catarrh" for thirty years. The usual appearances of atrophic rhinitis are obvious in the right nasal cavity. The septum is deflected to the left side. Possibly the conditions in the right nasal cavity are due to long-continued sinus suppuration in an abnormally patent nasal cavity.

[Since the above note was made, a chronic empyema of the right antrum has been drained.]

DISCUSSION.

MR. TILLEY added that the opening into the sinus was obvious under cocaine. The case raised the question of the advisability, or otherwise, of correcting a deflected septum so as to allow less air to pass through the right nasal cavity, which was abnormally wide.

THE PRESIDENT said he had thought of straightening the septum in these cases, as recommended by Dr. Mermod, of Lausanne, but he had not cared to urge a patient to have it done.

DR. DAN MCKENZIE said that three years ago he had a case with identical conditions—i.e., unilateral atrophic rhinitis in which the septum was markedly deviated. He operated on the septum, doing a submucous resection, and the result to the atrophic rhinitis was very satisfactory. Obviously there was some risk in the operation, because the septum became thinned as the result of the operation; and if the other side was made a little too patent there was the risk of leaving the patient with atrophic rhinitis on both sides, instead of on one.

A Patient in whom all the Sinuses were Operated on some Nine Years Ago for Chronic Suppurative Sinusitis.

By HERBERT TILLEY, F.R.C.S.

MISS H., had suffered since an attack of enteric fever from a profuse purulent nasal discharge, general ill-health and headaches. All the sinuses were freely opened and drained, with the result that the suppuration was entirely cured, the headaches ceased and her health so improved that the patient has steadily and successfully followed her vocation as a nurse. The openings into each sphenoidal sinus are easily seen.

DISCUSSION.

Mr. TILLEY added that among the many cases in the early days of sinus surgery in this country, this was the most satisfactory of the cases he had dealt with. The patient had been through many vicissitudes, and there were three or four separate operations. At first she refused to have the frontal sinuses touched, but eventually they were opened, as well as the sphenoidal sinuses. She had lost all her former headaches, there was no nasal discharge, her general health had been excellent since the operation, and the cosmetic result left little to be desired.

The PRESIDENT said he saw Mr. Tilley's case, and it was the type of case which would always remain cured. The patient might get influenza and secrete muco-pus for ten days, but she would not be troubled with her sphenoidal sinus again in this life.

Two Cases of Disease of the Sphenoidal Sinuses.

By W. STUART-LOW, F.R.C.S.

Case I.—A man, aged 38, who has suffered for years from tertiary nasal trouble. Both maxillary antra were opened from the nasal cavity for chronic sepsis, and the sphenoidal sinuses were also similarly affected. The interior of the right sphenoidal sinus can be clearly seen, the anterior wall having been removed; it is deep and narrow. The left is wide and shallow, and the frail anterior wall has been taken away. When the right sphenoidal sinus is swabbed out a sharp, fugitive pain is at once felt deeply in the right occipital region. The nasal bridge had quite fallen in, but his appearance has been greatly improved by repeated small solid paraffin injections.

Case II.—A woman, aged 43, who suffered for many years from nasal discharge and headaches. A year ago her sight began to be affected, especially in the right eye, and six months ago, on arriving in this country from Africa, she could only count fingers with this eye. She could still read print with the left eye, but about this time the field of vision on this side began to be affected, and a triangular scotoma was discovered passing in towards the fixation point. The ethmoid region on the left side was found to be the seat of sepsis and mucous polypi, and she had very severe frontal headaches most marked on this side. The Ogston-Luc operation was performed on the left side, and at a later date the sphenoidal sinus was opened by the removal of the anterior

wall; these sinuses were found full of pus and polypi. Since these operations contraction of the field has become arrested. As there is still considerable impairment of vision, it is proposed to remove all the middle turbinal on the right side and open up this sphenoidal sinus similarly to what was done on the left side. From the peculiar way in which the ocular fields were affected, it is likely that septic infection had taken place through the sphenoidal sinus roof, so that the fibres of the optic tracks lying next the bony roof were first affected. The fields, and some comment upon them, are exhibited by Mr. Angus MacNab.

**Chronic Sphenoidal Sinus Suppuration associated with Disease
of the Left Antrum and Ethmoidal Cells in a Woman,
aged 23.**

By W. H. KELSON, M.D.

SYMPTOMS first noticed at the age of 14, when discharge of pus took place suddenly from the nose as though an abscess had burst. Has always had more or less pain—referred to the centre of the head and frontal region. The left antrum, ethmoidal cells and sphenoidal sinus were found to be involved: the former were treated by operation and the latter by lavation, enlarging the opening, and applications. Marked improvement has taken place, but some discharge still remains. Sight has not been tested, but patient states that it is excellent in both eyes.

DISCUSSION.

Dr. DAN MCKENZIE said that on one occasion when opening or enlarging the sphenoidal sinus by means of the Hajek hook he broke the hook off, it remained fixed in situ, and he could not get it out. Next time the patient came, however, she brought it in an envelope.

Mr. STUART-LOW said that in his cases the sinus was well opened, and therefore there was not any likelihood of future trouble. This he had accomplished by means of the use of Hajek's hook and spoons; these he had found to be the most effective instruments for the purpose, and he strongly recommended them to members.

The PRESIDENT said the Hajek hook had never been of service to him, and had proved awkward by breaking off. These openings must be enlarged, and one must have punch forceps or rotate a Meyer's ring knife, or Luc's or Grünwald's forceps. More effective and powerful instruments were required than were available at present. He thought the electric burr could be safely and effectively used for these cases.

Dr. KELSON, in reply, said he had examined the case frequently, and he did not think that the pus came from the frontal sinus, but from a fronto-ethmoidal cell.

Cannula and Stylet used for making Applications to the Sphenoidal Sinus.

By W. H. KELSON, M.D.

By using these instruments contamination from the nose is avoided, and the application is prevented from coming into contact with parts other than those for which it is intended.



Dr. Kelson's sphenoidal sinus stylet and cannula.

Case of Sphenoidal Sinus Operated on and Cured of Suppuration of some Years' Duration.

By H. FITZGERALD POWELL, M.D.

FEMALE, aged 29, had been suffering from post-nasal discharge on left side which came down the back of her throat in purulent clots. She had very severe headache, especially in the back of her head and neck. This had been going on for some years. When seen this discharge was found absent in the front of the nose, but coming out of the left nasal opening behind. Both maxillary antra were quite clear on transillumination. She was treated by inter-nasal irrigation, &c., and her ethmoid removed by curetting, which improved her condition, but the discharge and pain continued in a lesser degree.

On October 26, 1911, she was put under a general anæsthetic, and the inferior wall of her left sphenoidal sinus broken down with small burrs, and the sinus washed out regularly up to April, when the pain had completely disappeared and only a small quantity of discharge was present.

Note.—May 30: This patient being so well had absented herself from observation and stopped the washing out, and when seen on May 30 was found with some discharge, but no pain in the head or neck.

DISCUSSION.

Dr. DAN MCKENZIE said he supposed it was the general experience that operations on the sphenoidal sinus were associated with a good deal of bleeding. In the first case he operated on he was surprised at the amount of bleeding from the region, where there seemed to be but little spongy tissue. He asked whether that was the experience of others, and whether it was the custom to pack. He had never felt it necessary to do so.

Mr. EDWARD D. DAVIS said that in one case there was a good deal of bleeding; the punching was done near the septum, and might have injured the sphenopalatine artery. But a small plug soon checked the bleeding.

Mr. ROSE said he knew of a case in which, after a sphenoidal sinus operation, the patient was seriously ill from the severity of the hæmorrhage. At the operation itself the bleeding was not very severe; it came on some hours afterwards.

Mr. HERBERT TILLEY remarked that when intending to operate in a sphenoidal sinus case it was desirable to apply cocaine and adrenalin fully twenty minutes before the general anæsthesia, so as to get the parts more or less anæmic; at the operation peroxide of hydrogen should be used on the swabs, as that stopped the oozing from the mucous membrane.

The PRESIDENT said he had read of cases where slight hæmorrhage at the time or afterwards gave rise to great trouble. But in cases where he had enlarged the opening by clipping away bone, under cocaine, he had never had hæmorrhage. Under chloroform these cases were never very troublesome, and were checked by peroxide. He had his cases prepared a full hour before the operation, which gave a better and more lasting ischæmia. Preparing with cocaine and adrenalin was an art; it was of no use to leave that to the latest appointed house surgeon, and it must be applied directly to the actual points, in fact "papered" along the nose and the front of the sphenoid. Also it was advisable to apply it on both sides.

Dr. FITZGERALD POWELL, in reply, said he was very much cheered by the sanguine view the President took, and the way he spoke in reference to the sphenoidal sinus operation, because he must confess he had felt some trepidation in attacking some of these cases, in which difficulty was found in getting a good view of the ostium. Nevertheless he could not help feeling that this operation, which necessitated the removal of the turbinate and opening up of ethmoid cells in addition to the cutting away of the sphenoidal wall, was not unattended with danger, and he thought that the operation should be approached with care and due consideration. He thought the President's suggestion of the use of the electric burr a very excellent one.

Case of Extensive Ethmoidal and Sphenoidal Sinus Disease on Both Sides.

By CYRIL HORSFORD, F.R.C.S.

THE cells had been thoroughly opened and the anterior wall of sphenoidal sinus removed. The openings and interiors of the sphenoidal sinuses were clearly visible. Mr. Horsford used Grünwald's modified forceps (oval cutting). He turned the instrument upside down and punched the lower floor.

Growth on the Left Vocal Cord.

By G. C. CATHCART, M.D.

TWENTY-TWO years ago the patient, then aged 36, was supposed to have a malignant growth on the left vocal cord. The late Sir H. Butlin, Sir Felix Semon, and Dr. P. McBride said it was undoubtedly malignant. Sir H. Butlin performed laryngo-fissure, but found on opening the larynx that the growth was not malignant. The cord was scraped and the condition described as leucoma. The voice was perfect up to five years ago, when it became hoarse. There is now a small growth on the left vocal cord, which is probably either a papilloma or a fibroma.

The PRESIDENT said he did not think the patient was any worse for the laryngo-fissure, as the vocal cords were moving freely.

Left Sphenoidal Sinus Suppuration in a Man, aged 35.

By G. SECCOMBE HETT, F.R.C.S.

THE sinus was opened in January, 1911. Subsequently the opening was enlarged by means of sphenoidal sinus forceps. Cavity gently curetted and nitrate of silver applied to interior of sinus. The left antrum, frontal sinus, and ethmoidal cells had previously been operated on. A submucous resection was also done to allow of access, as the cavity was very narrow owing to a septal deflection.

DISCUSSION.

The PRESIDENT said one of the benefits stated to result from submucous resection was that there was good drainage. To him it was always a question in these cases which to do first. One might do the submucous resection and put in light plugs of sterilized rubber, and then run the risk of damming up the discharge in forty-eight hours. If one operated on the sinus and did not put in a plug, after resecting the septum, the flaps might not keep together, and there might be an abscess or hæmatoma of the septum which might become infected.

Mr. HORSFORD said he had recently operated on two cases, in one of which there was much pus on both sides of the nose. The deviation was so marked on one side that he could not get at it properly, so he resected, and on the divided septum he placed a splint, and lightly packed with gauze for twenty-four hours. He removed the gauze early, and left the septum to be supported a little longer by the splint. In another case he resected the septum and spur on one side, and on the same side there was an antrum full of pus. He operated on the septum first, and radically treated the nasal antrum on the same side, putting in, in that case also, a rubber splint on the same side. Both cases did very well.

Dr. DAN MCKENZIE said he packed his nose cases with gauze after doing submucous resection, though he confessed he did it with some trepidation. He left a little passage above the plug for the drainage. He had never seen the temperature rise after operating on the septum in those cases, and his rule had been to do the septum first and the sinus later. Still, he regarded Mr. Hett's idea as a good one; it was much better than packing.

Mr. ROSE said he could recall five cases in which he did submucous resection before operating on the suppurating sinus. He was very nervous as to what the result would be in the first case. He had used the ordinary packing, gauze or wool, enclosed in a rubber fingerstall which filled up the nasal cavity thoroughly. Nothing unpleasant happened, so that he did not regret doing it. The packing was left in for thirty-six hours, and the sinus was operated upon at a later date.

Dr. W. HILL remarked that an instrument resembling two gridirons with a spring had been devised by Brünings for cases requiring drainage for the sinusitis, and at the same time to prevent a hæmatoma from forming in the septum. The idea seemed good, but when he (the speaker) had wanted to use the instrument it never seemed to fit in that particular case. Mr. Rose had just told him that he had once used Brünings's instrument, but there was a hæmatoma all the same. Perhaps this was due to its getting out of position.

Mr. HERBERT TILLEY pointed out the danger of patients turning over in their sleep and displacing instruments which projected from the nose.

Mr. EDWARD D. DAVIS said that in two cases he had treated the sinus suppuration and performed a submucous resection of the septum at the same time. He used solid rubber "splints" for twenty-four hours. There was no rise of temperature and the patients did well.

The PRESIDENT regarded Mr. Hett's suggestion for using a hollow rubber drainage-tube as a good one, as it kept up sufficient pressure and yet allowed drainage. He recommended the rubber sponge plug which was first introduced by Brünings. He had given up using cotton-wool, and he would be afraid to use gauze, as it retained the discharge and blocked the passage; moreover, the rubber sponge came out more easily than anything he had seen.

Case for Diagnosis.

By F. W. BENNETT, M.D.

NOISY respiration for six weeks. No pain. No other subjective symptoms beyond hoarseness for five months. Patient thought onset due to severe cold. Some pulmonary (? tuberculous) trouble three years ago. Punctured three days ago, but no pus escaped. Right cord immobile, with large, smooth swelling posterior and external to the right arytaenoid region.

DISCUSSION.

The PRESIDENT said the case did not raise, in his mind, the question of either malignancy, syphilis, or tubercle. The swelling was in the outer surface of the post-cricoid region and seemed to be non-malignant. It reminded him of a case under Sir Felix Semon, which he thought was a fibroma and which was operated upon from the outside, with a good result. There was a drawing of it by Mr. Waggett in the *Proceedings of the Laryngological Society*¹ twelve years ago.

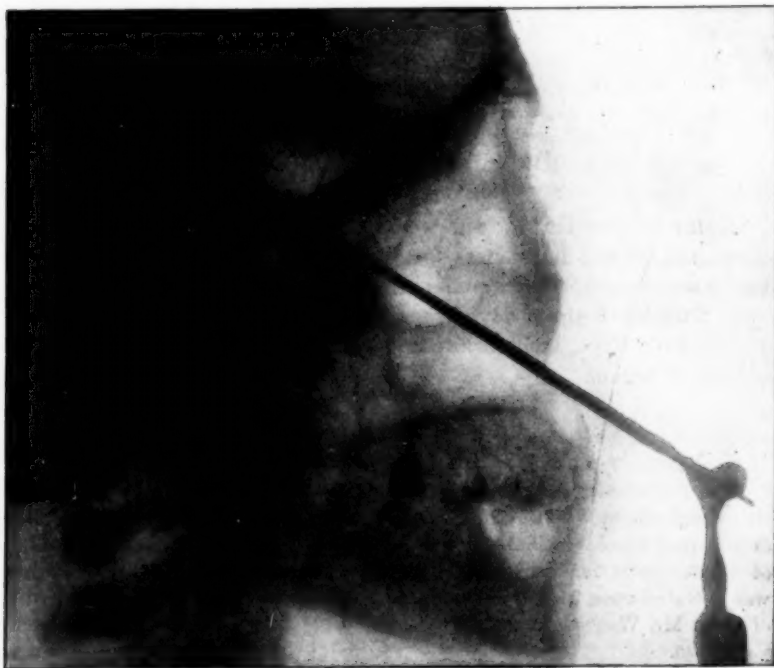
Mr. HARMER said the growth could be distinctly felt in the neck, as well as seen from inside the larynx. It was fairly extensive, and was probably encapsuled. It reminded him of a case of endothelioma in the lateral pharyngeal wall. It seemed to be suitable for removal from the outside, without opening the larynx.

¹ *Proc. Laryng. Soc. Lond.*, 1897-98, v, p. 66.

Case of Suppuration in the Accessory Sinuses.

By H. J. DAVIS, M.B.

THE skiagram shows a Hajek's hook in the sphenoidal sinus. The limits of the cavity are well shown. The patient was a girl, aged 22, who had been operated on for double frontal sinusitis and double



Skiagram showing Hajek's hook in the sphenoidal sinus.

maxillary sinusitis. The discharge, however, never ceased and continued for months. She was treated with vaccines with only slight benefit. When the sphenoidal sinuses were later thoroughly opened up the discharge ceased. At no time were any eye symptoms present. The exhibitor has not seen the case for two and a half years.

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SESSION 1911-12

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MEDICAL SECTION.

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The Council think it right to state that the Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

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Medical Section.

October 24, 1911.

Dr. FREDERICK TAYLOR, President of the Section, in the Chair.

Slight Strokes.

By S. T. PRUEN, M.D.

SOME years ago I was called to see an old lady, aged 80, who mentioned, amongst other matters, that she had that morning been worried with a slight feeling of "pins and needles," which had occurred simultaneously in the right arm and leg. The feeling had come on quite suddenly, without apparent cause, and had passed off, though not completely, in the course of a few hours. Thinking over this trivial but unusual occurrence, I felt driven to the conclusion that the cause must be cerebral in origin, and might be a stroke, though a ridiculously small and unimportant one. I ventured to express this opinion to the relatives, and suggested that there would probably be another stroke in the near future. Within three months this patient had a stroke affecting the right leg, and within a year an attack of right hemiplegia, which caused her death a few days later.

This case set me watching all my elderly patients, of whom I had a good many, chiefly ladies, and inquiring into the antecedents of all those who had obvious strokes, with the result that I found many of them could give histories of previous slight attacks of most varied kinds. In this way I gradually collected eighteen or twenty symptoms, or groups of symptoms. These symptoms I have set down under sixteen heads, including only those which I recognized *before* the serious attacks occurred, and which were sufficiently marked to enable me, at the

time, to predict a later and, usually, a more obvious stroke. From my own necessarily limited observations I am inclined to believe that more than three-quarters of the classical strokes have these early symptoms, as a prelude, once or twice repeated.

To make my position clear, I cannot do better than quote the description of a "first stroke" from so careful a clinical authority as Dr. Samuel Gee. On p. 17 of his "Clinical Aphorisms" he says: "The first thing you observe is that his speech is indistinct, in consequence of defective articulation. He complains of a feeling of numbness in the right arm and leg, especially in the hand; and, on further examination, you discover that he is suffering from a slight hemiplegia on the right side, affecting arm, leg, and face." This, then, according to Dr. Gee, is the description of a first stroke.

It is with some diffidence that I venture to disagree with my old teacher, at whose feet I sat many years ago, with great advantage to myself; but my own observations would lead me to say that this stroke was probably not the first one from which this particular patient suffered, that it was much more likely to have been the second, and might have been the third.

In dealing with these slight strokes I propose first to name the symptoms, and then to discuss them in detail. In describing them I premise that:—

- (a) The patient is aged over 50.
- (b) The attack is a unique experience, so far as he knows.
- (c) It comes on with absolute suddenness, like "a bolt from the blue."
- (d) The symptoms disappear very slowly, but with a steady progress.

To put the matter briefly: an elderly patient has a unique experience, with instantaneous onset, and slow recovery.

THE SYMPTOMS.

- (1) "Pins and needles" in arm and leg simultaneously.
- (2) Stumbling, with obviously no cause.
- (3) Giddiness.
- (4) Nausea.
- (5) Palpitation.
- (6) Faintness.
- (7) Sudden weakness.
- (8) Confusion of ideas.

- (9) Change of character.
- (10) Headache.
- (11) Sleepiness.
- (12) Feeling of deadness in the abdomen.
- (13) Paresis of one vocal cord.
- (14) Wasting.
- (15) Dysphagia.
- (16) Odd feeling.

Frequently there is a combination of one or more symptoms, but in almost every case one symptom will obviously predominate.

In addition to the symptoms which I have enumerated there are some which I have observed to occur in conjunction with others, but not as the solitary or predominant symptom of a first stroke. They are: asthmatic attacks, loss of motion in stomach and bowel (presumably from impaired sensation), and loss of sensation in lung and in bladder.

I do not think this is by any means an exhaustive list, but it includes all those of which I am reasonably sure. Some of the symptoms, it may be objected, are common to a variety of complaints. That is so, but on the other hand in each case, however familiar the symptoms seem to us, and however familiar we may think they ought to be to the patient, they will be explained by that patient as a different experience to what he has ever had before. Add to this the instantaneousness of the onset, and the slowness of departure, and we have all the factors necessary for recognizing a first stroke.

It will not have escaped your notice that in setting out these symptoms I have referred to at least six, the existence of which pointed to some interference with the functions of the vagus nerve. During the last two years I have been greatly struck with the very large part that the vagus (and presumably the sympathetic) plays in the condition of a patient who has had a stroke.

In the cases which I now propose to bring before you I examined the urine at regular intervals, and except where otherwise stated it was normal. The same remark applies, though with less certainty, to the condition of the heart and blood-vessels, except that in nearly all cases it was possible to feel the radial artery when empty, though the change was usually no more than I thought might have been accounted for by the age of the patient. With regard to the tension, I speak without any strong feeling of certainty. I have lately begun

to use the sphygmometer, which does not always corroborate my previous diagnosis on this point. On the whole, my patients who did not have strokes had quite as hard arteries as those who did; and generally the vascular lesions, when present, were less severe and of a different type from what I had expected to find. That degeneration of the vascular system and some local increase of tension are the probable accompaniments, if not the determining causes, of even slight strokes seems a reasonable inference; but that the gross lesions, which we recognize by hard arteries and obviously high pressure, are the necessary antecedents does not seem to me borne out by the facts. The vascular changes I suspect are of a more insidious nature than we are accustomed to associate with strokes. Again, if obviously high pressure had much to do with strokes, one would expect them to occur during violent exertion, and especially during the violent straining at stool from the constipation so common amongst these patients. I have only once seen a stroke, and that a very slight one, occur at such a time. So completely does the brain seem protected from such pressure, that one cannot help suspecting the presence of some undiscovered nervous mechanism controlling and guarding its blood-vessels. And yet, mechanical change has something to do with the onset of strokes, for I have known the vibration of railway travelling to be the apparent cause of several. But the causes which above all others seem to produce them are mental ones, either sudden shock or prolonged anxiety, and I think the latter far more dangerous than the former. In other words, whilst certain mechanical movements tend to strokes, it is molecular rather than molar motion which is the dangerous factor. Again, after even a slight stroke, vibration applied to the head often causes great discomfort, whilst violent straining causes none. It seems, then, that vibratory or molecular movement can easily pass the barrier of the protecting nervous mechanism. As a practical application of this, I always advise my patients who have suffered from strokes or concussion or fractured skulls to wear rubber heels, and they nearly always find great comfort from their use.

At this point I might briefly refer to the connexion between strokes and bleeding from the nose. Mr. G., aged 90, has had two slight strokes in two years. Between the two he had violent nose-bleeding; since the last he has had another violent nose-bleeding. Mrs. H., aged 82, whose case I describe later, had two strokes in two years, one with severe hemiplegia. A few months ago she had slight aphasia with

tingling in the right arm, and simultaneously with the onset she had bleeding from the nose.

Taking the symptoms in detail, we now get:—

(1) *"Pins and Needles" or Numbness occurring simultaneously in one arm and one leg.*

The first case was Mrs. N., the lady, aged 80, to whom I have referred, a very stout woman with a large, flabby heart. Three months after this slight stroke she had a very slight hemiplegia, and twelve months later a severe hemiplegia from which death ensued in a few days.

I have come across three or four such cases since, but the symptoms were related to me only after the onset of a more severe stroke set me inquiring as to earlier events.

(2) *Stumbling.*

When an old person, generally a woman, trips and falls, or even stumbles only, and says she felt exactly as if she had caught her foot in something, but that on examination of the spot it was evident to her that there was nothing in which her foot could have caught, such person has had a stroke.

Mrs. N., aged 81, fell in this way. Nine months later she had a severe stroke and died.

Mrs. I., aged 93, a tall, thin woman, with mitral incompetence, enlarged left heart, moderately hard arteries and not very high tension. She stumbled and, but for assistance, would have fallen, just as described above. Ten days later she had a severe stroke, and died in eight hours.

Mrs. U., aged 70. An asthmatic with a slightly enlarged heart, feeble beat, and occasional slight and transient glycosuria, had a similar fall. She had two strokes during the following two years, and died in twenty-four hours from the last one.

Mrs. C., aged 92. A contemporary and friend of Gladstone in his youthful days, a very strong-minded and vigorous woman, and up to the last two years of her life a great walker, with rather hard arteries but moderate tension, had a similar fall, which, while apparently doing no injury to back or limb, left her a decidedly changed woman. Two years later she had a fatal stroke.

(3) *Giddiness, without any ascertainable cause.*

I have had several cases of severe giddiness, coming on instantaneously, and going off very gradually, occurring in patients during the intervals between more obvious strokes; but only two where the giddiness was the first symptom to point to a series of strokes.

The first case was Mr. Q., aged 49, who was thrown from his bicycle and fell on his forehead. A week later he quite suddenly developed sudden excessive giddiness, accompanied by pain, and a tender spot over the back of the left occipital region below the superior curved line. This giddiness obliged him to lie on his back, and prevented his moving his head even ten degrees laterally. The symptoms were several weeks in passing off, and were followed by great debility and wasting. These attacks recurred three times during the succeeding year, but with diminishing severity. For the last year there has been no attack, and the debility has nearly passed off.

Mrs. V., aged 70. Last January she received a letter with bad news. She said she felt as if she had had a violent blow on the head, and has never felt the same woman since. At the end of April, one morning she got out of bed to shut the window, turned giddy at once, and fell on a chair. The giddiness, with headache and weakness, continued without intermission for some days, and then for some hours daily during the next two or three months. She seemed almost quite well in August, when she had another, slighter, but otherwise quite similar attack. Her heart is somewhat enlarged, and her arteries decidedly hard. Her urine is quite normal.

(4) *Nausea, usually without Vomiting.*

Miss T., aged 71, who had been a hæmophilic all her life, and had shown slight symptoms of Graves's disease for quite twenty years, had sudden violent nausea without apparent cause, continuing for some weeks, but gradually improving. Two months later she had right hemiplegia, followed in a few days by death.

(5) *Palpitation.*

Mrs. D., aged 75, who had a flabby, slightly dilated heart, with moderate beat, developed urticaria gigans, and shortly after had violent unexpected palpitation without obvious cause, followed by great debility, which only gradually improved. This was repeated on three occasions during the next three years. In the two succeeding years she had two trivial attacks of right face and arm paralysis, followed a few months later by almost complete aphasia and right hemiplegia. This patient is still living, eighteen months since this last attack, the symptoms of which have almost completely passed away. She still suffers almost continuously from urticaria, usually slight in form; with severer bouts every two or three months.

(6) *Faintness.*

Mrs. P., aged 85, has an occasional haze of albumin in the urine which is otherwise normal, except that she passes only 20 oz. in twenty-four hours, but then she eats and drinks very sparingly. She had three successive attacks of faintness at intervals of several months. These were followed, a few months later, by a slight attack of aphasia. She is still living. She had had one or two attacks of faintness many years before, but these three attacks she described as of quite a different character from those she had previously had. They looked more like painless attacks of angina, and their effects lasted for many days.

(7) *Sudden Weakness.*

This is a general weakness, and is likened by patients to that coming on after influenza. If patients have not had influenza they find a difficulty in explaining the kind of weakness. The point that most appeals to them is the unexpected suddenness of the onset, coupled with the many weeks that elapse before the strength is recovered.

Mrs. H., aged 82, had such an attack two years ago. Three months later she had a severe right hemiplegia from which she has not quite recovered.

(8) *Confusion of Ideas.*

Miss B., aged 82, who had a dilated heart with feeble beat, and occasional slight and quite transient glycosuria, also occasional oedema of legs of short duration, had such an attack. Two years later she had a severe hemiplegia, and died within a week.

(9) *Change of Character.*

Miss B., mentioned above, had a change of character following the confusion of ideas. From being a strong-minded woman she became one of weak character, and her cheerfulness gave way to depression.

Mrs. K., aged 73, had hard arteries, rather high tension, a small amount of albumin, and some oedema of legs. She had a slight loss of memory followed by indifference towards her children to whom she had been devotedly attached. In a few months she had a slight stroke followed by death.

An instantaneous change is not uncommon in what we call a mood. This comes on very suddenly in some people, but of course is only of transient duration. In the cases I am describing, what should have been a mood becomes a character. This change of character is less often completely recovered from than any of the other symptoms described in my list.

(10) *Headache.*

Mrs. P., mentioned under No. 6, had violent headache of sudden origin (taking days to clear up), between two of the attacks of faintness, and separated by some weeks from either. She had never been subject to headaches.

Mrs. X., aged 84, a short, fat woman with a flabby heart and, towards the end, with very slight glycosuria, had violent headache. It came on quite suddenly whilst she was crossing a road, and it took some days to clear up. She had never been subject to headaches. A few months later she had hemiplegia and died within a week.

(11) *Sleepiness.*

Miss U, aged 67, suddenly took to sleeping for twenty hours a day. This diminished about one hour daily, so that at the end of a week she was only sleeping thirteen hours daily, and at the end of a fortnight her hours of sleep were almost normal. Six months later she had slight left hemiplegia, and started sleeping twelve hours daily. This came right in about a week, and the hemiplegia passed off in a few months. Three years later she had a more severe attack of left hemiplegia, from which she has never fully recovered. Her urine is normal, except that she only passes 20 oz. to 30 oz. in each twenty-four hours.

(12) *Feeling of Deadness in Abdomen.*

Mrs. I. D., aged 78, had this feeling simultaneously with a slight attack of aphasia.

I have frequently noticed this symptom as occurring with ordinary strokes. The patient describes herself as feeling dead inside, below the waist. I have known a somewhat similar description given by a woman who had a six months' child with very lively movements, after the child suddenly died. The opposite feeling was described by the shepherd in the Gloucestershire Pageant, who when he was nervously waiting to be received by Queen Elizabeth said in the dialect of the time: "I do feel so grigly in my innards." If that man had had such a stroke as I am describing he would have said: "I do'ant feel grigly enough in my innards."

(13) *Paresis of one Vocal Cord.*

Mrs. D., aged 61, had sudden paresis of the left vocal cord with no ascertainable cause. Two years later she had a slight right hemiplegia, and a year after that a more severe one. The cord slowly righted itself in about ten months.

(14) *Wasting.*

Miss W. aged 73, a very stout woman with slight mitral incompetence. Wasting came on quite suddenly in this an otherwise healthy woman. After a few weeks the condition came to a standstill, and presently she began to put on weight again. Six months later she had aphasia, some hemiplegia, and incontinence of urine, and died in two days.

(15) *Dysphagia.*

Mrs. P., aged 80, had had diphtheria in adult life, followed by some amount of dysphagia; but one day the dysphagia greatly increased, and remained in that condition. It has increased again once since, until now she eats so slowly that when she has finished one meal it is often time to begin another. Between the two attacks of dysphagia she had a slight attack of aphasia.

Colonel N., aged 80, had very severe mitral and aortic incompetence. He had a sudden attack of dysphagia, which never quite passed away. Two years later he had a slight hemiplegia. Three years after that another slight attack, and five years later he died.

(16) *Odd Feeling.*

Miss I., aged 80, a lady with rather hard arteries, suddenly stopped at the beginning of a meal and said, "I don't know what is the matter with me, I do feel so odd. I have never felt anything like it before. What shall I do?" After half an hour she quieted down, but it was some days before she was quite herself again. Ten months later she had an attack of aphasia, and two months after that right hemiplegia, from which she died three days afterwards. During the last two or three years of her life she suffered from vertigo, but the attacks did not come on with the suddenness, nor did they pass off with the extreme slowness, characteristic of the attacks of giddiness which I have described under heading (3).

A colleague of mine, Dr. Arthur Cardew, told me of a similar attack which occurred to a friend of his:—

This gentleman, aged 70, suddenly stopped in the middle of family prayers and said, "I do not know what is the matter with me, I cannot go on." He recovered from this condition during the day, but a fortnight later he suddenly said: "A canary is singing in the room." He first hunted for it, and then became convinced that the noise was in his own head. In the course of a few days this condition passed away. About two weeks after this the maid called him as usual in the early morning, and pulled up his blind. He said "Good

morning" in his ordinary voice. Half an hour later she came back to get the silver basket from his room, and found the door barricaded from the inside, but unfastened. An entrance was effected at last by the family, when the furniture was found piled up against the unfastened door, with the silver basket on top. The patient was lying on the bed comatose and hemiplegic. Ten days later he began to get very thin. He never recovered his usual weight again, he never was able to walk again, and five years later he had another stroke from which he died in a few days.

This case completes my list; but I think I have seen paralysis, or rather paresis, of some of the ocular muscles, if not in a first slight stroke, at least in a very early one. I think, also, that I have seen paresis of the smaller muscles attached to the occipital bone and first two vertebrae—the obliqui and the recti capiti. I have always myself named these the accessory ocular muscles, and used to call them so when teaching anatomy. We use them all day long when using our eyes. Even when reading a page of this size my eyes have been unable to travel from left to right and up and down without the assistance of these small upper neck muscles. I think you will have noticed that they also appear to get paralysed in the early stages of alcoholism. In this state a man begins to see double, and also finds some difficulty with the finer movements of his head. He cannot move it accurately, or keep it quite steady. To obviate this difficulty, and perhaps to conceal this increasing inco-ordination from his friends, he braces up his head by means of the larger neck muscles, which rather overdo their part in these delicate movements, and so he keeps his head very noticeably rigid.

I have never recognized asthma with certainty as the precursor of a stroke, but an asthmatic attack is no uncommon result of a stroke in patients who have never suffered from asthma before. The worst cases of asthma I have ever seen were those occurring after strokes. I think nearly 10 per cent. of cases of stroke get, as a result, asthmatic attacks of greater or less severity. In most cases these asthmatic attacks lasted an hour: they were followed by very little cough or expectoration, and there was no bronchial trouble afterwards.

Mrs. M., aged 70, who had never had asthma before, had a severe attack about every two months (the intervals were somewhat irregular) during the year which elapsed between her first and her last stroke.

Miss I., aged 63, had three attacks during the eight months which elapsed between her first and her last stroke. She also had never so suffered before.

Miss O., aged 67, did not have asthma; but ever since her last hemiplegic attack eight months ago she has had an uncomfortable feeling in the region of the bifurcation of the trachea, a feeling which impels her to cough. She resists the desire, as she finds the cough does not relieve the feeling. Also, ever since the stroke she has been unable to give a deep, satisfying yawn.

I have spoken of the feeling of deadness in the abdomen. This appears to be due to loss of movements of stomach and intestine, and is followed by the indigestion, flatulence, constipation, and foul mouth so common after stroke. There is not only loss of tone, but I think not infrequently a certain amount of dilatation of stomach and bowel. This frequent sequence of stroke and visceral trouble makes me wonder whether other cases of dilatation may not sometimes be due to central nervous disorders, rather than to mechanical or chemical causes.

Judging from analogy in all these cases, I should guess that the loss of motion is not from actual loss of muscular power, but from the loss of sensation in these parts interfering with reflex movement. The same condition is apt to occur in the lung. Last year I had under my care a gentleman with extensive cancer of the neck. A large cavity extending backwards to the cervical vertebrae replaced the front of the neck. The floor of the cavity was occupied by a tracheotomy tube inserted into the remains of the trachea, and an œsophageal tube inserted into the remains of the œsophagus. The discharges trickled down between the tracheotomy tube and the trachea, but were quickly and easily coughed up. This condition of affairs continued some two months, when the patient suddenly developed agraphia and right hemiplegia; also he ceased to cough. For two days the discharges trickled down unheeded into the lungs, yet there was no loss of respiratory muscular power, for when some unusual stimulus suggested a cough, as when something touched the remains of the epiglottis in the floor of the mouth, he coughed with such vigour that he shot a mixture of blood and mucus on to the curtain 8 ft. from him and 7 ft. from the ground. The loss was evidently a sensory not a muscular one, and the patient was practically drowned in his own secretions, as the lung quietly, painlessly, and steadily filled up within two days.

The same condition of affairs holds good with the bladder. I have now a patient suffering from stroke who habitually retains in his bladder the last 3 oz. of urine, and who often dribbles when the bladder is full. I daily wash out his bladder, using a funnel and 6 ft. of tubing. If the boracic lotion I use happens to be rather too hot he will, though

feeling no pain, involuntarily contract his bladder, and not only drive out the last 3 oz. but drive them out against the pressure of the fluid in the funnel held 5 ft. above him. Here, again, it seems to be sensory and not motor nerves which have been interfered with.

I feel sure that this anæsthesia of mucous membrane is often the cause of the hypostatic pneumonia which is said to come on in old people who have to lie on their backs for long, especially after a fractured hip. When I find such patients getting hypostatic pneumonia I feel suspicious that possibly the pneumonia was not the after-effect of the fracture, but that both the fracture and the pneumonia were the after-effects of a slight stroke. The innervation, and therefore the nutrition, of the lung is interfered with, whilst the bronchial secretion is inefficiently coughed up, not so much on account of the position of the patient, though that is a factor, as on account of the anæsthetic condition of the mucous membrane.

I should like to emphasize again the sensory origin of much of the disturbance due to strokes, and the widespread visceral lesions that result, and if I were in the habit of using unauthorized language, I should say that strokes were frequently followed by *Bradycasteer*, *Bradyenteron*, *Bradycolia*, and *Bradypneuma*.

May I sum up my paper in five sentences:—

- (1) Slight strokes almost always precede ordinary ones.
- (2) Slight strokes are always followed by ordinary ones.
- (3) The nervous implication in strokes is much more widespread than is generally recognized.
- (4) The predisposing causes of strokes are not the gross lesions we generally associate with them.
- (5) Molecular rather than molar movement is the determining factor.

DISCUSSION.

Dr. WALTER CARR said he felt much indebted to Dr. Pruen for having directed the attention of members of the Section to certain important symptoms and warnings in elderly people which might serve to indicate the danger of something more serious happening in the future. He supposed that the main object of the paper was that not only should we be on the look-out for and recognize those symptoms and the dangers which they implied, but that, having recognized them, we should take precautions, so that, as far as possible, we might be able to avert the danger. That raised a point which he noticed Dr. Pruen did not discuss. He spoke of "stroke" from the clinical standpoint, and he (Dr. Carr) was not clear whether by "stroke" he meant a cerebral hæmorrhage, or whether he intended also to include under that term a cerebral thrombosis. It was well known how difficult in elderly people it often was, during life, to be certain, in a case of hemiplegia, whether the cause was hæmorrhage or thrombosis, and obviously the line of treatment which should be adopted in warding off a threatened attack of hæmorrhage was very different from that which one had to employ in endeavouring to avert the danger of thrombosis. It seemed to him, from the description which Dr. Pruen gave of several of his patients, especially from the cardio-vascular conditions present, that thrombosis was more probable than hæmorrhage. It was known that cerebral hæmorrhage was often preceded by warning symptoms, in some cases due to minute hæmorrhages, and in others due perhaps to the conditions which led up to the hæmorrhage, especially high tension. Dr. Pruen would probably say that symptoms which came on very suddenly and passed off gradually were those which indicated a small hæmorrhage, whereas those which persisted for a considerable time, like the headache and insomnia from which these patients often suffered, were more probably due to the predisposing conditions present. He remembered seeing, some years ago, an elderly man who was obviously suffering from cerebral hæmorrhage. The condition was typical, it was a severe case, and the patient died a few days later. About a week before the onset of the severe attack he had been seized, in his bathroom one morning, with very intense headache, which he had never experienced before; almost immediately he was violently sick and felt very ill for a time. Gradually he recovered, and before the second and final attack was beginning to go about again. He had no doubt that the first attack was due to a minute hæmorrhage, and that the vomiting which followed rapidly lowered the arterial tension, and so led to clotting in the small ruptured vessel and hence to arrest of the commencing hæmorrhage; doubtless, as the patient resumed his normal activities the vessel again gave way, this time with a fatal result. A large number of the symptoms, however, which Dr. Pruen described were consistent, he thought, with a feeble circulation, which might lead to cerebral thrombosis; even though

the symptoms might be sudden, he thought they were consistent with an anæmic condition of the brain, such as often preceded thrombosis. He referred to such symptoms as the sensation of pins and needles, sudden stumbling, faintness, sudden general weakness, and others to which Dr. Pruen alluded. At any rate, he would like to ask Dr. Pruen particularly what view he took of these cases, whether he regarded them all as examples of cerebral hæmorrhage, or whether he was willing to admit that some of them, at least, might have been due to thrombosis; and if so, how he proposed to distinguish between the two, so as to get some indication as to the kind of preventive treatment to adopt.

The PRESIDENT (Dr. Frederick Taylor) said that some of the conditions mentioned by Dr. Pruen did not, perhaps, correspond to the idea usually entertained as to the nature of a stroke. The author would doubtless realize that himself. For instance, take sleepiness; in the author's cases, was the onset of that symptom of the acute character which the conception of a stroke implied? Of course, whether the occurrences were of the nature of sudden events, or of slower origin, they were equally important as regards the question under discussion—namely, as conditions which one could recognize as being antecedents of the more severe vascular lesions which carried off so many patients. It would be of interest also to be told what was the pathological link between the preliminary symptoms and the further attack. With reference to the allusion of the author to straining at stool as being a cause of raised arterial tension, he asked if he was quite sure that that was a correct view to take. Was the straining at stool productive of increased arterial tension, or was it not rather an increased venous tension?

Dr. F. PARKES WEBER wished to remark upon the tendency to dilatation of the bladder, and to the constipation, which was alluded to in the paper, and which the author considered was due to some dulling of local sensation. In all probability, the dulling of some kind of sensibility was an etiological factor in the constipation which was apt to occur in elderly persons, and it was, perhaps, partly the cause of the dilatation of the bladder, which occurred sometimes in the absence of any very decided prostatic obstruction in such persons. But Dr. Pruen had not entered into the question of whether this dulling of sensibility was in the mucous membrane or in the muscular tissue of the affected parts. In this connexion it was interesting to note that S. G. Shattock and T. G. Brodie¹ found that in cats, the result of rendering the interior of the bladder anæsthetic by cocaine was to abolish micturition so long as the local effect of the drug lasted. But he believed that other experiments on the subject of the sensibility of the bladder and of the rectum made it, on the whole, probable that dilatation of the bladder and troublesome

¹ Vide S. G. Shattock on "Idiopathic Dilatation of the Bladder," *Proc. Roy. Soc. Med.* (Path. Sect.), 1909, ii, p. 99.

constipation of the kind alluded to, which sometimes occurred in elderly persons, was due rather to dulling of muscular sensibility than to diminution of sensation in the mucous membrane: and such dulling of sensibility was not restricted to elderly persons. Rectal sensibility might be gradually diminished by habitually disregarding Nature's calls to defaecation, and according to A. F. Hertz, loss of sensibility in this way was a frequent cause of constipation (dyschezia) in young persons as well as in old persons. In regard to *tabes dorsalis*¹ it was possible that some of the cases of dilatation of the urinary bladder which occurred occasionally even before the onset of any ordinary symptoms of *tabes* were due also to dulling of vesical sensibility rather than to actual paralysis or paresis of the vesical musculature.

With regard to the use of the term "strokes," he noticed that the author avoided discussing "strokes" in young people. Perhaps the author thought that "strokes" were associated with degenerative change. In Germany, the term "heart-stroke" ("Herzschlag") was often used in speaking of cardiac syncope. When he read the title of Dr. Pruen's communication, viz., "Slight Strokes," he was right in supposing that "heart-strokes" would not be included in the discussion, but he thought reference would be made to cerebral "strokes" of various kinds in young as well as old persons. One of the most typical kinds of "slight strokes" was the transitory hemiplegia, or hemiparesis, which occasionally occurred in young persons who were the subjects of mitral stenosis. An interesting point in such cases was that the Babinski sign was present—the extensor response to plantar stimulation—on the affected side. The hemiparesis might pass off in a few hours. It might be that the embolus broke up into more minute portions, and passed on to the capillaries. He believed, however, that it had been seriously maintained that some cases of transitory hemiparesis occurring in patients with mitral stenosis were not due to embolism, but were caused by temporary vasomotor disturbance (spastic). Another kind of slight "stroke" which was not very rare was that connected with tertiary syphilis of the brain and arteries supplying the brain. For instance, a man whom he knew was coming out of the opera, and the "stroke" consisted in temporary aphasia, so that instead of being able to drive to his home, which was a considerable distance off, he had to walk all the way, because he could not tell the cab-driver where he wished to go. Next morning he could speak quite well again. Not long afterwards he suddenly developed severe cerebral symptoms, and died. Post-mortem examination of the brain showed a syphilitic arterial disease, it was said. Various other transient paralyses might be due to tertiary syphilis. Possibly some slight "strokes" were due to disease of the middle ear, or were connected with it in some way or other, perhaps by inflammation spreading through and causing local pachymeningitis. He remembered seeing, in 1898, a case of transient hemiparesis in a man aged 44½, with middle-ear

¹ Cf. F. P. Weber, "A Note on Local Anæsthesia in regard to the Causation of 'Idiopathic' Paralysis and Dilatation of the Urinary Bladder," *Practitioner*, Lond., 1909, lxxxii, p. 445.

disease. In that year the patient was treated by an aural surgeon, and as far as he (Dr. Weber) knew, the man never had another attack of the same nature. In that case the hemiparesis was on the right side and very slight; two days later the patient had merely a slightly more active knee-jerk on the right side than on the other, the hemiparesis having practically disappeared. Death occurred twelve years later from a different disease.¹

Dr. ROBERT HUTCHISON said he thought the Section was to be congratulated on having had a paper of that kind read before it, because it was one based upon experience in general practice, by a man who had the opportunity of seeing a large number of elderly persons and studying their diseases. It was the kind of paper which the Section would like to have more of. He joined with others who had spoken in saying that the whole view which one took of the subject under discussion depended on one's definition of the term "stroke." From merely reading the title of the paper he would have said it meant symptoms resulting from a small hæmorrhage. He had always thought the word "stroke" meant apoplexy, either grave or of lesser degree. But it was obvious that the varying conditions which Dr. Pruén described could not be due to hæmorrhages, even to small ones; the conditions he described must embrace several different vascular disorders, some more or less transient in nature, which might take place in the brain. One of these, which had not been mentioned, was illustrated by the transient hemiplegia or aphasia associated sometimes with migraine, which was presumably due to vascular spasm. It was possible that in some of these old people there was a spasm of vessels, which quickly passed off, and the circulation was restored after it. Some of those cases were also perhaps due to transient local œdemas of the brain. One speaker had referred to transient paralysis in parturient women. When he was a student he read a paper before the Students' Society in Edinburgh, on "The Paralysis of Pregnancy," having come across a number of instances of hemiplegia and speech defects, more or less permanent, occurring in women who were pregnant. He found that there was very little known about the subject, and it was very difficult to find any literature on it, but the conclusion arrived at was that some of the cases were thrombotic, due to the increased coagulability of the blood during pregnancy, whilst some seemed to be caused by œdema of the brain. At the autopsy on one of his cases the only thing found was an œdematous condition of one side of the brain. He thought it possible that in some of the cases described by the author there was transient cerebral œdema. It was only by some such explanation as that—by "roping in" a number of different vascular disorders, such as transient thrombosis, transient spasm,

¹ Dr. Weber knows of the case of an old man in whom right-sided hemiplegia was apparently due to uræmia. In that case the uræmic attack proved fatal, but it is possible that transient hemiparesis may sometimes be connected with less severe uræmia.

and possibly transient œdema—that one could explain the different clinical conditions which Dr. Pruett had described. It would be interesting to hear, in the reply, how Dr. Pruett would define the term "stroke" as used in the paper.

Dr. PRUETT, in reply, thanked members for their patient hearing, and for their valuable remarks. With regard to the term "slight strokes," he did not think he could altogether defend it. He wanted a word which would include a good many vascular changes such as hæmorrhage, embolism, thrombosis, and even œdema. He had used the term as a clinical one, having no special relationship to any one of these pathological conditions. He had a wide opportunity of observing clinical cases, but never the privilege of making autopsies, such as members of the Society who were attached to large hospitals could obtain. He felt that under these circumstances his views on the pathology of the cases were not worth bringing before them. With regard to his own cases, he thought some of them were caused by hæmorrhage and some by thrombosis. With his mind full of "strokes," he had on one occasion mistaken for them a case of sulphonal poisoning, and on more than one other, cases of uræmic convulsions: the rapidity of the improvement first showed him his error. Dr. Carr mentioned a very interesting case of intense headache and sickness occurring to a patient in a bathroom. This was evidently a slight stroke, as was shown by the occurrence of a severe one not long afterwards. He regarded the excessive sleepiness mentioned in his paper as a definite stroke, and the cause of it as hæmorrhage. It started as a sudden seizure, and passed off very gradually. The important point was that on the next occasion the patient had sleepiness and hemiplegia simultaneously. There seemed no doubt, therefore, that the second attack of sleepiness was produced by the same cause as the hemiplegia, and if so, then presumably the first also. He believed that in all cases the slight initial attacks were of the same nature as the later more severe ones, because one found the symptoms of them to be of every degree of severity, from the slightest to the most severe, when occurring in the later and more severe strokes. With regard to the question raised by the President as to straining at stool, he (the speaker) had mentioned it because it had so frequently been stated to be a cause of strokes. There was some fullness of the brain in that condition, probably chiefly venous in character. He did not, as he had stated, consider it at all dangerous, though this straining did bring on an attack in one instance, but only a slight one, and he had no stroke brought on by even violent exertion of any other kind. With regard to the point raised by Dr. Parkes Weber as to whether the paresis of the bladder was due to dulling of mucous membrane sensibility or lack of sensitiveness of the bladder muscles, as, in the case mentioned, the bladder contracted so powerfully when a sufficient but not excessive stimulus was applied—he thought the loss must be in the mucous membrane rather than in the muscles. He did not think the change in the bladder could be due

to old age, because it was a condition which steadily improved. With regard to transitory hemiplegia in the young, he had seen very little of it; he had only included in his paper his own experiences. Dr. Parkes Weber's remarks about strokes in association with tertiary syphilis were of great interest to him, because evidently there were slight strokes connected with syphilis, though he (the speaker) had no experience of them. Neither had he much experience of the slight strokes in parturient women, to which Dr. Hutchison referred. Nor had he seen a case of transient hemiplegia in migraine, though he knew of such cases. The point was that those conditions passed off quickly, whilst slight strokes, such as he described, passed off slowly. As to treatment, by far the most important point was to keep such patients free from worry and excitement. Next in importance, but a good way below it, was to avoid vibration, such as would be caused by an ordinary railway journey. To avoid vibration he always recommended his patients who suffered from strokes, concussion, or fractured base, to wear rubber heels, usually to their great comfort. Good food, massage and outdoor exercise, short of fatigue, were excellent in most cases.

Medical Section.

November 28, 1911.

Dr. FREDERICK TAYLOR, President of the Section, in the Chair.

The Influence of some Foodstuffs on Gastric Secretion.

By F. CRAVEN MOORE, M.D., and H. E. ALLANSON, M.D.

THE observations of Pawlow and his co-workers having established the varying influence of different dietetic substances on the rate of gastric secretion and the activity of the secreted juice in the dog, it was accepted as at least highly probable that a similar relation would obtain in the human subject, and in a limited fashion the truth of this has already been established.

In view of these results it appeared to us that it would not only be of interest, but of some practical importance, to determine by observation on the human subject the varying effect on gastric secretion of certain foodstuffs—essential and accessory—which by their use or interdiction in disorders of gastric activity have been credited empirically with having some particular relation—ameliorative or causal—with such disorders.

The substances so far included in our investigations are water, tea, coffee, cocoa, milk, albumen water, meat extracts, and alcohol; in addition, a few observations have been made on the effect of tobacco-smoking.

The methods employed consisted in the administration on the empty, fasting stomach, at 8 a.m., of a test breakfast composed of four "breakfast biscuits" and 10 oz. of fluid, either water, or freshly infused tea, coffee or cocoa, without milk or sugar, or milk or albumen water containing the white of one egg in 10 oz. of water, or two teaspoonfuls of meat extract in 10 oz. of water, or 2 oz. of whisky with 8 oz. of water. The fluid was heated to an agreeable temperature.

20 Moore & Allanson: *Foodstuffs and Gastric Secretion*

The stomach contents, removed one hour later, were immediately filtered, and in the filtrate the free hydrochloric acid and the total acidity were estimated by titration with decinormal soda solution, dimethylamidoazobenzol and phenolphthalein respectively, being used as indicators; the peptic activity was estimated according to the Edestin method of Fuld and Levison.

TABLE.

No.	Name	Sex	Age	WATER			TEA			COFFEE			COCOA		
				HCl	T.A.	P.	HCl	T.A.	P.	HCl	T.A.	P.	HCl	T.A.	P.
1	A.E.H.	M.	28	42.0	64.0	7.7	51.3	68.7	9.0	63.7	87.0	10.0	53.3	80.0	8.6
2	B.N.G.	M.	25	34.3	58.3	5.0	31.7	57.3	5.7	—	—	—	—	—	—
3	E.W.	F.	32	50.0	68.7	8.6	53.3	72.0	8.9	41.0	60.7	7.6	38.0	53.0	6.8
4	E.W.	F.	24	42.0	67.3	7.4	52.3	71.0	8.3	47.3	67.0	7.7	46.0	63.3	7.7
5	H.S.	M.	32	44.7	61.3	8.2	52.7	69.7	8.3	—	—	—	45.3	64.0	7.4
6	A.Y.	F.	45	46.3	60.7	8.2	60.3	74.3	8.8	71.0	84.7	11.0	—	—	—
7	M.Y.	F.	54	47.7	62.0	7.9	70.0	86.0	10.3	—	—	—	—	—	—
8	F.M.	F.	17	44.0	64.0	7.5	64.0	80.7	9.4	—	—	—	66.7	86.7	10.4
9	E.E.	F.	24	55.3	76.0	8.2	71.3	88.7	10.8	—	—	—	60.7	82.3	9.4
10	G.D.	M.	50	35.5	45.7	5.5	54.0	63.3	8.0	73.3	82.3	11.0	—	—	—
11	M.P.	F.	36	47.3	68.7	3.0	43.3	61.7	6.0	—	—	—	—	—	—
12	A.P.	F.	26	37.3	60.7	5.6	62.8	80.7	9.4	—	—	—	—	—	—
13	A.W.	F.	20	31.7	52.7	5.0	37.0	56.0	6.0	43.7	52.0	6.0	—	—	—
14	E.M.	F.	37	40.3	61.3	6.0	40.3	60.7	3.5	—	—	—	—	—	—
15	J.McL.	M.	43	46.0	64.3	7.7	—	—	—	—	—	—	—	—	—

HCl = Free hydrochloric acid; T.A. = Total acidity; expressed in terms of number of cubic
P = peptic

The results obtained with the test breakfast, consisting of four biscuits and 10 oz. of water, were made the basis for comparison throughout the observations, and in each individual case the measure of the secretory reactivity to water and to the particular substance under investigation was determined on the average of not less than three experiments with each.

The fifteen individuals on whom the observations were made

included normal healthy subjects and subjects both with and without definite gastric disorder.

The results, as expressed in the table, are the averages of a series of observations made with each test breakfast in the several individuals of the series.

On analysing these results it is found that an infusion of *tea* induces

MILK			ALBUMEN WATER			MEAT EXTRACT			ALCOHOL			TOBACCO		
HCl	T.A.	P.	HCl	T.A.	P.	HCl	T.A.	P.	HCl	T.A.	P.	HCl	T.A.	P.
34.7	94.0	5.4	55.0	74.0	9.7	74.3	98.3	11.6	54.7	74.7	8.0	59.3	78.3	9.0
—	—	—	—	—	—	—	—	—	24.7	52.7	4.6	34.7	50.7	5.5
—	—	—	—	—	—	73.0	96.7	11.5	—	—	—	—	—	—
—	—	—	—	—	—	50.7	74.7	8.3	—	—	—	—	—	—
—	—	—	—	—	—	52.7	74.3	8.2	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	59.3	89.7	8.6	—	—	—	—	—	—
—	—	—	—	—	—	68.0	98.3	10.0	—	—	—	—	—	—
54.3	102.3	8.8	—	—	—	78.0	102.3	12.7	—	—	—	—	—	—
57.0	98.6	7.0	—	—	—	61.7	75.0	9.7	—	—	—	—	—	—
12.0	70.7	2.6	—	—	—	44.0	69.7	6.1	—	—	—	—	—	—
13.0	67.0	2.9	—	—	—	55.0	87.7	8.2	—	—	—	—	—	—
—	—	—	—	—	—	41.7	73.3	6.2	—	—	—	—	—	—
—	—	—	61.7	84.7	8.8	53.7	87.7	7.3	—	—	—	—	—	—
27.7	69.7	4.6	—	—	—	—	—	—	—	—	—	—	—	—

centimetres of decinormal soda required to neutralize respective acidities in 100 c.c. of filtrate, activity.

a greater secretion of gastric juice than does water; a comparison of the averages of the total observations in fourteen cases demonstrates this very clearly.

		Water			Tea		
HCl	...	42.7	53.2
T.A.	...	62.2	70.8
P.	...	6.7	8.0

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In the individual cases a similar, but varying, relation is seen to obtain in all but two (Nos. 2 and 11), where the secretion is actually diminished.

In three individuals a number of observations were made with a solution of caffeine (3 gr. in 10 oz. of water), with a view of elucidating the secreterogenic factor in infusions of tea; in two the averages of repeated observations showed that such a solution of caffeine was more potent than tea, and in the third, whilst the stimulating effect was somewhat less than that of tea, it was much greater than water.

		Water		Tea		Caffeine
HCl	...	46.5	...	54.8	...	54.9
T.A.	...	68.0	...	77.0	...	79.0

The average of the total observations showing that a watery solution of caffeine and an infusion of tea are equally stimulating.

The results obtained with *coffee* indicate that individual susceptibility is more pronounced than in the case of tea, and that whilst the averages of the total observations in the six cases where comparison may be instituted appear to show that it is a somewhat more powerful stimulus of gastric secretion than tea, this depends chiefly on its marked effect on those who may be regarded as susceptible.

		Water		Tea		Coffee
HCl	...	41.0	...	51.3	...	56.6
T.A.	...	59.8	...	67.5	...	72.3
P.	...	7.0	...	8.1	...	8.8

Cocoa, whilst showing some degree of individual variability in its action, is a stimulus to gastric secretion more powerful than water, but less powerful than tea, as is shown by comparison of the following total averages in six cases:—

		Water		Tea		Cocoa
HCl	...	46.3	...	57.4	...	51.8
T.A.	...	66.9	...	75.1	...	71.5
P.	...	8.0	...	9.1	...	8.4

The results of the observations with *milk* are particularly interesting, in view of its general and somewhat empirical use as a food in disorders of the stomach and in conditions of general debility. In five out of six cases in which observations were made it proved to have a stimulating effect on gastric secretion less than that of water:—

		Water		Milk
HCl	...	43.8	...	33.1
T.A.	...	63.2	...	83.7
P.	...	6.3	...	5.2

This peculiar relation of milk to gastric secretion depends in all probability upon the inhibitory action of the fat contained in it. It is of interest to note that whilst the stomach contents after a milk test meal show considerably less free HCl and pepsin than after the administration of water, there is a great increase in the total acidity. So far as we have been able to investigate this phenomenon, it would appear to be due to the presence of fatty acids resulting from the splitting of the milk fats.

A watery infusion of a *meat extract* is a powerful stimulus of gastric secretion, as appears from a comparison of the following averages of the total observations in twelve cases:—

		Water		Tea		Meat extract
HCl	...	47.0	...	54.3	...	59.3
T.A.	...	68.0	...	71.6	...	85.6
P.	...	7.3	...	8.0	...	9.0

Similarly, albumen water appears to exert a considerable stimulating effect on gastric secretion, as is shown by repeated observations on two individuals.

The observations on the action of *alcohol* and *tobacco-smoking* on gastric secretion, made on two normal individuals, are of interest, in that they show that either agent may have a stimulating or a depressing effect on secretion, probably in accordance with the susceptibility of the individual.

DISCUSSION.

Dr. NATHAN RAW desired to ask if the authors could give any indication of the strength of the solutions used; whether the tea, coffee and cocoa were concentrated or diluted.

Dr. HINDS HOWELL said he would like a little more information about the effect of alcohol and tobacco. The number of tests seemed to have been limited, but in one of the individuals alcohol and tobacco seemed to have had a stimulating effect, while in the other the effect was depressant. It was well known that a person could rapidly acquire tolerance of poisons, such as alcohol and tobacco, and therefore he would like to know if the person whose gastric juice was stimulated by the alcohol was or was not an habitual drinker of alcohol—he did not mean one who took it to excess. And in regard to tobacco, if one was a smoker and the other a non-smoker before the test.

Dr. CROOKSHANK asked for details as to the temperature of the solutions employed.

Dr. ROBERT HUTCHISON desired to raise one point which was apt to vitiate the effect of such observations—namely, the acid neutralizing power of certain foods, such as milk. There was no doubt that, weight for weight, milk was a better fixer or neutralizer of acid than any other food, partly by reason of its mineral salts, and partly by its proteins, and he wondered if this would explain the apparently anomalous results given by milk. It would be interesting to repeat the observation, using not whole milk but skim milk. This might easily account for the low acidities which milk seemed to yield. Otherwise the results were very much what one would have expected. They confirmed the observations of Pawlow and others, although he agreed with Dr. Harry Campbell in regard to the observation of Sir William Roberts, who found that tea delayed gastric secretion, and attributed this to the inhibitory action of the tannic acid of the tea on the pepsin. He did not think that Sir William considered the action on the acidity. In that physician's time test meals were not in vogue, and the observations were made in test-tubes. He would be surprised to find that the tannic acid had no effect, but the matter might be tested by a control experiment.

Sir JOHN BROADBENT remarked that the authors said that some of the people who were tested were healthy, and some had gastric trouble. He would like to know which of the cases suffered from gastric or duodenal ulcer, or from acute gastric conditions. If there was hyperchlorhydria, was this indicated by the experiments? He was interested to know if there was *excessive* secretion in response to the stimulus of the different substances ingested in these cases in which there was already local irritation.

The PRESIDENT (Dr. Frederick Taylor) said it was somewhat new to him to hear that tea and coffee were so stimulating to the gastric functions as this paper showed them to be. Many people considered that they had the opposite effect. He gathered from the observations now given that there had been considerable uniformity in the results, so far as they had gone; but in regard to alcohol and tobacco the numbers were too small to lead to definite opinions with regard to their action. In respect of dietetic treatment or of treatment of stomach diseases, the authors had not drawn any detailed conclusions, yet that would have been a valuable addition. The remarks of Dr. Hutchison led him to make the suggestion that if tea could be deprived of its tannin, and further submitted to experiment, the share of the tannin in the above effects might be shown.

Dr. CRAVEN MOORE, in reply, said that the tea was made with two teaspoonfuls of an ordinary blend in 10 oz. of water, in the way tea ordinarily was made. The coffee was made with three teaspoonfuls of coffee to 10 oz. of water. All the fluids were agreeably hot. With regard to tea, the observations made by Sir William Roberts could not be recorded as conclusive at the present day; they were not done *in vivo*, and to add tea to an artificial digestion mixture could not possibly give results of any value. There could be no

doubt that tea was a stimulant of gastric secretion. The relation of tea to dyspepsia was peculiarly interesting. It had long been recognized that tea exerted a deleterious effect in dyspepsia. Formerly, when dyspepsia was regarded as a manifestation of defective gastric secretion, it was generally considered that the mal-influence of tea was due to some tanning effect it might have on the mucous membrane of the stomach leading to diminished secretion. But now, when we knew that the vast majority of cases of dyspepsias were associated with an excessive secretion of gastric juice, the deleterious effect of tea could be directly attributed to its stimulant action, which was as manifest in cases with pathological hypersecretion as in normal conditions. The results of the observations with milk could only be interpreted as evidence of actual depression of secretion. There was no doubt that milk would absorb more acid than would a tea test breakfast, or a water test breakfast, owing to the additional proteid. But that would not account for the diminished peptic activity. Experiments with skim milk and cream had already been made, and they showed that the acidity of the stomach contents when skim milk was given was higher than when whole milk was given.

Dr. ALLANSON, in reply, said that the observations with alcohol and smoking detailed under Case I were made on himself, while Case II was one of his colleagues in the hospital. They were both smokers, and in both the result of smoking a cigar during the hour the meal remained in the stomach was an increased secretion of gastric juice. With regard to alcohol, he had the results of some observations (not on himself) which showed the effect of alcohol in excessive quantities. Divided into three series, the first observations prior to which and during which no alcohol was taken, gave for a plain water test breakfast an average free hydrochloric acid of 33, and a total acidity of 55.6. About a fortnight later alcohol was taken at night previous to the test breakfasts, and on three consecutive days with the same test breakfast there was an increase in the free hydrochloric acid, 40, and in the total acidity to 59.6. About six weeks later steady indulgence in alcohol had resulted in an attack of gastritis. The averages of three test breakfasts showed a decrease in free hydrochloric acid to 18.3 and in a total acidity to 41. Still a week later all subjective symptoms having disappeared, another series of three test breakfasts showed a still further decrease, the free acidity being 8.6 and the total acidity 32.6. So it would appear that whilst the initial effect of alcohol was stimulating to gastric secretion the effect of taking it to excess was to diminish secretion. The following experience was of interest in connexion with the observations on milk: In a female patient, aged 38, suffering from chronic gastric ulcer and perigastritis, and dilatation, a series of test breakfasts gave an average free HCl of 28 and a total acidity of 55. Milk caused some gastric discomfort—the patient saying that the milk seemed to “hang heavy” in her stomach—and vomiting. On giving her 2 to 3 oz. of meat infusion and meat extract previous to taking the milk she no longer experienced discomfort and the vomiting ceased.

On the Association of Hysteria with Malingering, and on the Phylogenetic Aspect of Hysteria as Pathological Exaggeration (or Disorder) of Tertiary (Nervous) Sex Characters.

By F. PARKES WEBER, M.D.

HYSTERIA was at one time, as the derivation of the word from the Greek *ὑστέρα* (uterus) shows, regarded as a disorder connected with the female sexual organs, but the frequent occurrence of similar symptoms (hysteria being sometimes as pronounced in males as in females) has long since proved that the idea of the exclusive connexion of hysteria with the female sexual organs is absurd.

PHYLOGENETIC ASPECT OF HYSTERIA.

Sex characters may be divided into: (1) Primary, those concerned with the sexual organs; (2) secondary, those concerned with the breasts, the facial hair, the features, the voice, the form of the skeleton, (e.g., the shape of the pelvis and the cubital angle of the outstretched upper extremity), the development of the skeletal muscles and the general conformation; and (3) tertiary. By tertiary sex characters I mean those dependent on the nervous system, including both characters of instinct and characters of mind (reasoning). Such nervous characters, unlike primary sex characters, are not the exclusive property of either sex; they are called male or female characters merely accordingly as they predominate in one or the other sex. From the phylogenetic point of view I believe that hysteria, or rather much of what is now grouped together as hysteria, may be regarded as a pathological exaggeration (or disorder) of certain tertiary (nervous) female sex characters.

According to this (phylogenetic) conception the exaggeration (or disorder) of so-called tertiary female sex characters in the male would

account for occasional cases of "male hysteria." I am not here concerned with the temporary "hysterical" conditions not rarely observed in the male as the result of violent emotions, starvation and grave nutritive disturbance, or as forming a familiar part of the effect of certain toxic substances, such as alcohol.

The phylogenetic aspect of hysteria is, as far as I can see, not necessarily opposed to Pierre Janet's, Babinski's, and some other modern views on the subject.

PATHOMIMIA.

I shall not trouble to bring forward any special evidence here to prove that ordinary hysterical symptoms are frequently associated in the same patient with attempts to simulate disease, accident, or injury, and with deception of all kinds ("mythomania," &c.). The fairly frequent occurrence of such association is recognized by all—so much so, that in a recent paper on "Hysteria and Mythomania" Dupré and Logre quote Hartemberg as maintaining that hysteria (which Charcot called "*la grande simulatrice*") "*est d'essence mythopathique; elle peut se définir la mythomanie des syndromes.*"¹ Moreover, the frequent use of the term "hysterical malingering," or "hysterical simulation," proves that the occurrence of such associations is generally acknowledged.² In fact, hysteria is frequently characterized by two kinds of simulation of disease, or "pathomimia," if I may be allowed to borrow a term suggested by Paul Bourget for his friend Dr. Dieulafoy, who employed it in one of his most sensational medical communications³: (1) The unconscious mimicry of disease, so well referred to in the writings of Charcot, Sir James Paget, &c., to which the term "neuromimesis" has been usually applied; and (2) the conscious, more or less voluntary, imitation of disease that may be termed "hysterical malingering."

¹ "Proceedings of the Twenty-first Congress of Alienists and Neurologists, 1911," *Presse Médicale*, Par., 1911, xix, p. 660.

² I am about to publish elsewhere two remarkable cases, which I have had an opportunity of following over a great number of years, and which illustrate the intimate association of simulation and hysteria. Hysterical anaesthesia and hysterical paralysis occurred in both cases.

³ Communicated to the Paris Academy of Medicine, June 9, 1908, *Presse Médicale*, Par., 1908, xvi, p. 369.

HYSTERICAL MALINGERING.

I need simply explain my conception of hysteria and my view of the kind of simulation so frequently associated with it ("hysterical malingering") in order to show what I believe to be the pathological connexion between the two, though it is possible that some of the multitudinous morbid phenomena which have been described by various authors as "hysterical" may find no place in my scheme. To avoid confusion I shall refer only to such universally recognized features or symptoms of hysteria as: (*A*) "functional" muscular paralyses and spasms and hysterical convulsions; (*B*) hysterical pains and paræsthesiæ (hysterical "clavus," "globus," &c.); (*C*) hysterical disorders of the circulatory system (hysterical palpitation, pulse irregularity, and vasomotor disorders); (*D*) the well-known suggestibility of hysterical persons and loss of spontaneous will-power. I maintain that all these features or symptoms of hysteria can be explained as resulting from pathological exaggeration (or disorder) of tertiary (nervous) female sex characters, characters which, in normal degree, might have been useful in regard to selection by the other sex.

Thus *A* and *B* may be regarded as exaggerations of the slight ailments to which the "weaker sex" are supposed to be naturally more liable than the "stronger sex" and which call for the sympathetic interest of the protecting males. Some at least of the hysterical symptoms grouped under *C* may be regarded as representing an exaggeration of the normal vasomotor excitability ("erethism" if more than normal) of young females (including facile blushing and responsive emotional changes in pulse-frequency), which constitute part of their attractiveness to the other sex. So also *D* may be regarded as an exaggeration of the tendency of the female mind to bend to the opinion of (male) authority, a tendency which when recognized as present is (or, has been) often gratifying (flattering) to the male.

I now come to the question of "hysterical malingering" and all kinds of deception and simulation without any adequate rational cause. In past ages (from early prehistoric times onwards) simulation or deception of various kinds must often have been serviceable to the weaker female in protecting herself from the stronger (and sometimes cruel) male, as well as in enabling her sometimes to get her own way by "getting round" her male partner. By a natural process of "survival of the fittest" the facility for effective deception would, in a barbarous

age, persist or gradually increase in the females, that is to say, it would become a tertiary sex character; and it must be recognized that the average female of the present day seems not to have altogether lost this inborn aptitude for deception.

Of course, deception and "tricks" of various kinds were also often useful to the male in his struggle for life, but they were more necessary to the female, and therefore at the present time the facility (instinct) for deception is probably greater in the average female than in the average male.¹

In both sexes this tendency to deceive is normally from an early age kept in check by the exercise of memory and reason, but in many hysterics the tendency in question is present in such an abnormal (pathological) degree that it cannot be suppressed. Such persons practise simulation and deception of various kinds without any adequate (rational) grounds, and such "hysterical malingering," hysterical "mythomania," &c., may be justly regarded, I think, as an exaggeration (or disorder) of an instinct resulting by a process of survival of the fittest from the necessities of our primitive ancestors (especially, female ancestors). According to this view the greater frequency of such "hysterical malingering," "hysterical mythomania," &c., in women than in men is explained as a result of the fact that the tendency or facility (instinct) for deception is normally greater in women than in men.

RELATIONSHIP OF DECEPTION TO HYSTERIA.

From my point of view, therefore, the intimate relationship of deception (without adequate, rational, motives) to hysteria is clear. I would, in short, claim that most (but not necessarily all) of the phenomena ordinarily classed under the heading "hysteria" are dependent on a special kind of instability of the nervous system and may be regarded as the expression of a pathological exaggeration or disorder of certain tertiary (nervous) sex characters, the presence of which, in normal degree, can be accounted for on a phylogenetic or evolutionary basis.

¹ H. Campbell ("Differences in the Nervous Organization of Man and Woman," London, 1891, p. 54) writes: "Women, it has been said, are born actors. May not the cunning and dissimulation so frequently found in the hysteric state be in some measure attributable to an innate tendency in this direction, evolved in the manner indicated?"

Some at least of the normal tertiary sex characters are psychical and are due to hereditary functional properties of the higher central nervous system, functional properties which have gradually developed as the result of sexual selection and the survival of the fittest in past ages. The tendency to simulation and deception (without adequate motive) characteristic of some hysterical subjects may be regarded as an exaggeration (or disorder) of an instinct which is normally greater in women than in men, the greater prominence in women of the tendency or instinct to deceive constituting a normal psychical sex character. Such psychical sex characters, whether normal or hysterical—i.e., exaggerated or disordered—are not acquired by means of memory and reason, but are inborn or developmental "instincts," the term "instincts" being here applied to functional reactive properties of the higher, psychical portion of the central nervous system, reactive properties which have been acquired not owing to repeated ancestral voluntary or rational efforts, but simply owing to the laws of evolution acting by the survival of the fittest.¹

Like other instincts (for instance, the instinct of self-preservation),² they may be to some extent controlled by the exercise of memory and reason, and, on the other hand, may be rendered conspicuous and dangerous to their possessor (or their possessor's neighbours) by influences such as mental and physical overwork and shocks, which weaken the normal rational action of the mind in its restraining influence over the instincts. The therapeutic preventive indications are therefore largely educational, but prevention in such matters can obviously only be rendered really effectual by means of sexual selection and eugenics: in fact, just as sexual selection in the past is responsible for the existence of the tertiary (nervous) sex characters and their abnormal variations of the present day, so sexual selection in the present and future will modify the nervous sex characters, as well as other instinctive nervous tendencies of future generations.

¹ The protective nervous instinct which causes some insects to "sham death" when in the presence of animals who prey on them (but refuse to eat their dead bodies) develops, by the laws of evolution, as a result of the "survival of the fittest," just like "protective mimicry" does, owing to which some butterflies and insects have come, when resting, to resemble leaves of plants or twigs, &c.

² It is notorious that some persons, on sudden emergencies, show wonderful power of controlling their instinct of self-preservation, and this power of control is partly a result of education.

ADDENDUM.

My brief exposition of what I call the phylogenetic or evolutionary conception of hysteria as being due to an exaggeration (or disorder) of tertiary (nervous) female sex characters has also, I hope, explained why hysteria (according to my conception of hysteria) is so frequently associated with a tendency to simulate disease, accident, or injury, or deceive in some kind of way, in the absence of any adequate (rational) motives.

I would here repeat that the so-called tertiary (nervous) female sex characters, though naturally best marked and most striking in the female sex, are not the exclusive property of the female sex. They occur likewise, though they are usually less conspicuous, in the male sex, and it is by their occasional exaggeration (or disorder) that I explain the occurrence of hysterical and irrational (apparently motiveless) deception and simulation ("hysterical malingering") in males.

Teleology (that is to say, the modern, Darwinian, or evolutionary idea of teleology) finds a place in the phylogenetic aspect of hysteria, and it seems to me also to claim a place in regard to other conceptions (Babinski, Freud, Janet, &c.) of hysteria. For instance, is it not conceivable that hysterical excessive suggestibility may on the whole be useful rather than harmful for persons whose own will-power is pathologically deficient? Moreover, in cases in which wretched experiences have made their psychical marks or "psychical traumata" in the past and in which the present condition is in some way gravely affected by subconscious reminiscences, "separation of consciousness" may be supposed to bring not only inconveniences and dangers, but also a certain kind of relief.

Some functional nervous symptoms usually classed as hysterical are not readily explained by my conception of hysteria. So-called "hysterical vomiting" seems to be a pathologically exaggerated action of the reflex defensive mechanism by which poisonous or irritating ingesta are normally rejected. But it may sometimes be on the borderland between hysteria and voluntary action simulating disease.¹

¹ Cf. F. P. Weber, remarks in *Brain*, Lond., 1904, xxvii, p. 193. Besides the vomiting which may be associated with "hysterical malingering" there is a kind of vomiting coming under the class of *ordinary* malingering. Thus, a man wishing to simulate some organic nervous disease—e.g., *tuberculosis dorsalis*—may try to imitate the gastric crises by drinking large quantities of fluid and then inducing vomiting, like German students, on certain festive occasions, sometimes vomited their beer.

Furthermore, in regard to the greater frequency of simulated diseases, self-inflicted skin lesions, &c., in women than in men—I do not, of course, here refer to simulation of diseases or of accidental mutilations in cases in which the simulation is attempted for obvious reasons, such as to escape military duty in countries where conscription is practised—it may be remembered that when a woman is depressed and altogether discontented with the life she has to lead she is more likely than a man would be to try to attract attention or pity by simulating disease or injury. A man usually has much more open to him; he can seek a new country or (if he does not endeavour to obtain relief by drink or gambling) he can take part in dangerous ventures of various kinds which bring excitement and temporary relief.

DISCUSSION.

Dr. J. A. ORMEROD said he did not think such an interesting paper should be allowed to pass without comment. Dr. Parkes Weber had elaborated a most interesting and original idea as to the nature of hysteria, but it was so very far-reaching that he feared that one could not criticize it adequately at a moment's notice, or say whether one would like to adopt it or not. Still, it seemed to him to be novel, and to be as likely to be true as many of the other theories now ventilated on the subject. Yet he would enter a protest against the prominence given to hysterical malingering and hysterical imitating. By malingering one means conscious shamming. Of course, he admitted that some hysterical patients did sham and exaggerate; but so did many other people who were not hysterical. He believed that if an inquiry were made, it would be found that there were as many shamers among the non-hysterical as among the hysterical. As to the particular class alluded to at the end of the paper, namely, those who mutilated themselves, producing skin and other lesions, and who were generally called hysterical, he had seen this certainly in women who were definitely hysterical, but he thought that many of these self-mutilators had no other signs of hysteria, and was inclined to place them in a different category. He believed there was a difference between the self-mutilating woman and the hysterical woman of the usual type. At the meetings of the Dermatological Society of London, women with self-inflicted lesions of the skin were often shown, and it was commonly said that they did it in order to elicit sympathy. But in hospitals he never could see what sympathy these patients received; sometimes the

treatment of them was very unsympathetic. He remembered a woman who was under his care at St. Bartholomew's Hospital, and who made ulcers on her skin. She had been in University College Hospital, where she was treated. From all he could hear, she had got no sympathy at that hospital. The lesions which she made on her face had produced large keloid scars. But she persisted in producing ulcers and went next into St. Bartholomew's Hospital, where again she got no sympathy.

Putting aside such cases of conscious shamming, one came to the class of case which Dr. Parkes Weber spoke of as pathomaniacs, called by Sir James Paget neuro-mimetics. In these it was assumed that the hysteria was imitating something, though the imitation was unconscious. But this was very difficult to prove, because imitation implied the presence of a motive, and since the motive was one which the patients did not know of, and which the doctor did not understand, how could one prove that there was any imitation at all? Most of these cases were called mimetic simply because the clinical phenomena seen in them were like those of some other disease. But that did not in the least prove that there was imitation; it simply indicated that the two series of events were clinically alike. When a new growth in the mediastinum produced symptoms very like those of aneurysm, one would not say there was imitation. Besides, in many of the hysterical imitations the phenomena were not like the original, for the likeness presented too many differences. The more we knew about it the less likeness there was; the supposed imitation was really due to the ignorance of the observer.

Nevertheless, the phenomena of imitation were not essential to Dr. Parkes Weber's theory; it went deeper than that. If hysteria were really a morbid exaggeration of feminine characters, the fact of male hysteria deserved special consideration. A male hysteric, according to Dr. Parkes Weber's theory, must necessarily be a "feminine man"; at any rate, he must have the tertiary sexual phenomena which had been referred to. Sometimes men were found with certain secondary sexual characteristics, and one might reasonably expect them to bear the tertiary also, but he was not aware that such men were more subject to hysteria than were others. Nor did he think that male hysterics had, apart from their hysteria, tertiary feminine characteristics. One saw cases of male hysteria, notably traumatic ones, which occurred in workmen, soldiers, &c., who certainly were not always of the feminine type of mind. Upon objections like this he did not wish to lay too much stress; but he did think that Dr. Weber's theory should be closely compared with the numerous clinical facts which were known about hysteria; the originality and interest of the theory demanded that this should be done.

Dr. S. A. K. WILSON said it afforded him pleasure to find himself in agreement with the words of caution which Dr. Ormerod had uttered with

regard to Dr. Parkes Weber's theory, which was a very interesting and suggestive one. It was curious that the sexual sphere should be ransacked again for solutions of the problems of hysteria. Dr. Wilson thought it would be a mistake to offer criticisms of the view which had been put forward until there had been an opportunity of thinking it over more carefully, and especially of applying it to instances of the disease, as that was the only way in which they could satisfy themselves as to the truth or otherwise of the theory. As it was a novel idea, what he would say might be modified in the light of subsequent knowledge. One or two difficulties suggested themselves. First, with regard to the universality of mythomania, as a basis for hysteria, it was not at all his experience that mythomania was so widespread in that condition. Many hysterical patients were seen who were not conscious or unconscious simulators, although there was a small proportion of cases in which that mythomaniac element was extraordinarily developed. On the other hand, there were cases of mythomania who presented no hysterical stigmata. Therefore, he agreed with Dr. Ormerod that one was inclined to class mythomania as something apart from hysteria. The two might coincide: there might be some cases with hysterical stigmata and the faculty for deception, but that others did not exhibit the accepted signs of the disease. Therefore, it might be largely a matter of coincidence. Various Continental observers had come to the same conclusion. There was secondly the question of the interpretation of the various symptoms which Dr. Parkes Weber had described as in accordance with his views. For instance, he had referred to hysterical palsies and spasms, and hysterical convulsions, and said the reason these developed in the female was that they were such as called for the sympathetic interest of the protecting male. If that was the case, one might have thought the symptom to arouse the greatest sympathy, from the male standpoint, would have been hysterical mutism, but that was not common in females suffering from hysteria. There were difficulties in regard to hysterical hemi-anæsthesia, hysterical amblyopia, and many other manifestations which were accepted as symptoms of the disease. He did not at present see how one could interpret these symptoms on the view that, in some way, they were associated with the development, in the female, of tertiary sexual characters.

Dr. ROBERT HUTCHISON said he would describe the paper rather as a description of hysterical phenomena than as a real explanation of the nature of hysteria; because, even granting that the view advanced by Dr. Parkes Weber was correct, and that it covered the phenomena of hysteria, one was left still to face the question as to why those tertiary sex characters became exaggerated in certain persons. And he had seen—as everyone who had much to do with children must have seen—marked cases of hysteria in very young children at

an age when one would not have expected tertiary sex characters to appear. This seemed to be a difficulty in the way of accepting such a view as that now set forth.

Dr. PARKES WEBER, in reply, thanked all who had discussed the paper, but reminded them that (as shown by the heading) his paper was on *an aspect* of hysteria; he had not yet advanced it as a fully developed theory. He had admitted that there were some points on which the facts did not obviously fit in with his conception. When trying to explain such a condition as hysteria or some form of insanity, one could either attempt to do so on the basis of some functional or organic change supposed to be present in the nervous system, or by the kind of signs and symptoms manifested. In the case of most forms of insanity and in hysteria, in the present state of our knowledge, he did not think it was possible to find out what was the real nature of the abnormal physical condition in the nervous system. Dr. Hutchison asked why sex characters should be sometimes exaggerated. He (Dr. Weber) took it that in regard to characters, either physical or functional, when many persons were examined, one would always come across variations from the ordinary—viz., in some there would be exaggeration, in others diminution, and in others a qualitative variation. He had been obliged to allude to the simulation of disease by hysteria, that is to say, "hysterical neuro-mimesis," but it was the voluntary simulation of disease by hysterics to which he had specially referred. Dr. Ormerod suggested that the simulation of skin diseases, &c., occurred usually in persons who showed few or none of the ordinary signs of hysteria. That was a fundamental point on which he (Dr. Weber) took a different view. He thought that the "hysterical malingerers" who mutilated their bodies and produced ulcers and artificial skin eruptions were people who showed occasionally characteristic signs of hysteria, such as hysterical paralysis or hemianæsthesia. With regard to hysterical mutism, hysterical aphonia, hysterical amblyopia, hysterical deafness, and hysterical anæsthesia of various kinds, he regarded them all as being connected with a peculiar kind of nervous or psychical weakness, an exaggeration of the kind of *relative* psychical weakness which was a normal tertiary sex character in *average* females. (The exaggeration of this sex character was essentially a weakness or deficiency.) Just as an insect of certain kinds, when in the presence of more powerful enemies, became paralysed and apparently dead, and just as molluscs shrank into their shells when frightened, so the weaker hysterical individuals, when their nervous system was tired and exhausted, "withdrew" or "contracted" themselves in their peculiar ("hysterical") kind of way, as was shown by the loss of the power of speech, by constriction of the visual field, by partial loss of sensation, &c. And he believed that all that entirely fitted in with his view of hysteria. The occasional occurrence of hysteria in children fitted in with his aspect of

hysteria as an exaggeration or disorder of certain nervous instincts. All instincts, and certainly sexual instincts, might be precocious, and with precocity abnormality in quality might be associated. He did not know whether woman-like characters were on the whole more common among hysterical males than among non-hysterical males, that is to say, whether "male hysterics" were on the whole more "feminine" in their characters than ordinary men. In conclusion, he would like to point out that he was not referring to cases classed under the headings neurasthenia and psychasthenia: but the borderlands of hysteria were not sharply defined. On the one hand, it merged into epilepsy ("hystero-epilepsy"), on the other hand, into insanity. It was notorious that it was not rare for hysterical malingerers and self-mutilators to finish in lunatic asylums. More or less psychological deficiency of some kind or other was often a prominent feature in hysterical individuals.

Medical Section.

January 23, 1912.

Dr. FREDERICK TAYLOR, President of the Section, in the Chair.

The Vaccine Treatment of Simple Goitre.

By ROBERT MCCARRISON, M.D., Captain I.M.S.

HAVING shown in the course of my researches on the ætiology of endemic goitre that the infecting agent of this disease exists in the intestinal tract, and that a plentiful amœbic infection was present in this situation in the vast majority of all cases of goitre in Gilgit [1], [2], [3], I have been engaged in endeavouring to cultivate amœbæ from the fæces of sufferers from this disease. During the course of this work I was struck with the constant character of the bacillary growths which appeared in the medium I employed. This medium was that recommended by Musgrave [6] for the cultivation of amœbæ and has the following composition: Beef extract 0.5 grm., sodium chloride 0.5 grm., agar 20 grm., tap-water 1,000 c.c., and is of an alkalinity of minus 1. It occurred to me to prepare a vaccine from such bacteria as grew on this medium and to employ it, as an experimental procedure, in the treatment of recent cases of goitre. At this stage of my investigations no attempt was made to isolate any particular organism. The vaccine employed was, therefore, a composite one and contained organisms capable of growth on an alkaline and feebly nitrogenous medium. This vaccine was administered in selected cases in doses of from 150 million to 350 million; the inoculations were made at intervals of from seven to ten days. The results obtained were most striking. The following cases (Nos. V and X) will serve as illustrations.

Case V.—Age of patient, 19. Occupation, water-carrier. Type of goitre, uniform parenchymatous. Circumferential measurement of neck over the goitre, 38.5 cm. Duration of disease, six weeks. Treatment, composite

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vaccine prepared from organisms grown on Musgrave's medium from his own faeces. Number of inoculations, two. Duration of treatment, ten days. Result, complete disappearance of the goitre. Final measurement of neck, 36 cm. Diminution in circumferential measurement of the neck, 2.5 cm.

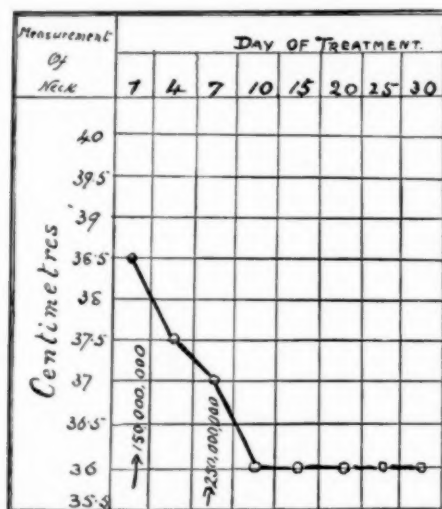


CHART 1.

Showing measurements of neck at various stages of treatment, also doses and times of administration of vaccine,



FIG. 1.

Case V. Diminution in circumference of neck = 2.5 cm.

The patient carried on his work as regimental water-carrier during the whole course of treatment. (Chart 1, fig. 1.)

Case X.—Age of patient, 19. Occupation, coolie. Type of goitre, parenchymatous; two small adenomata in right lobe and one in isthmus.

Circumferential measurement of neck over the goitre, 38 cm. Duration of disease, two years approximately. Treatment, composite vaccine prepared from organisms grown on Musgrave's medium from his own faeces. Number of inoculations, six. Duration of treatment, sixty days. Result, disappearance

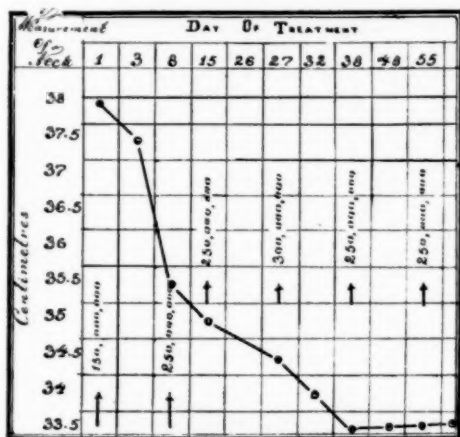


CHART 2.

Showing measurements of neck at various stages of treatment, also doses and times of administration of vaccine.



FIG. 2.

Case X. Diminution = 4.5 cm.

of goitre with the exception of the small adenomata in right lobe and isthmus. Final measurement of neck, 33.5 cm. Diminution in circumferential measurement of neck, 4.5 cm. The patient carried on his work as a coolie during the whole course of treatment. (Chart 2, fig. 2.)

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It was then noted that the bacterial growth on the medium referred to was composed, as a rule, almost wholly of a bacillus which presented the characteristics of the coli group. This bacillus differed, however, from the typical "*Bacillus coli*" in so far that it did not produce indol,

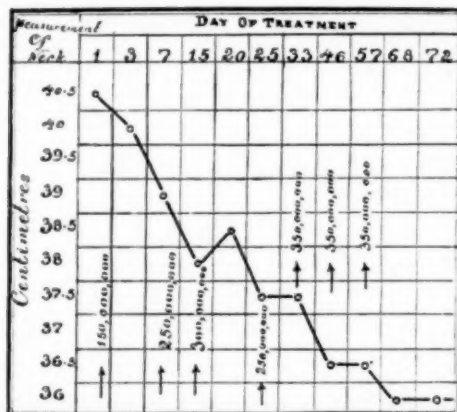


CHART 3.

Showing measurements of neck at various stages of treatment, also doses and times of administration of vaccine.



FIG. 3.

Case XI. Diminution = 4.5 cm.

and that it decolorized the litmus on a saccharose medium instead of reddening it. I am indebted to Major W. F. Harvey, I.M.S., of the Pasteur Institute of Kasauli, for working out the characteristics of this organism.

A vaccine was prepared from the bacillus, and I employed it in sixteen selected cases of goitre. The initial dose was in each case 150 million. The dose was gradually increased by 50 million till in some cases a maximum dose of 350 million was reached. The inocula-

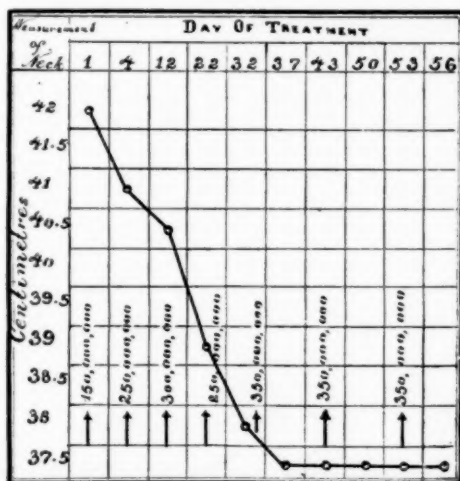


CHART 4.

Showing measurements of neck at various stages of treatment, also doses and times of administration of vaccines.



FIG. 4.

Case XII. Diminution = 4.5 cm.

tions were made at intervals of from seven to ten days. Cases XI and XII are amongst the sixteen cases treated in this way.

Case XI.—Age of patient, 23. Occupation, priest. Type of goitre, arenchymatous; adenoma about the size of a pigeon's egg in right lobe.

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Circumferential measurement of neck, 40.5 cm. Duration of disease, "many years." Treatment, autogenous vaccine made from the coliform organism referred to in text. Number of inoculations, seven. Duration of treatment, seventy-two days. Result, disappearance of goitre with the exception of the tumour in right lobe. Final measurement of neck, 36 cm. Diminution in circumferential measurement of neck, 4.5 cm. This man, prior to treatment, acted as a control to the previous case (Case X); while so acting his goitre increased somewhat in size. (Chart 3, fig. 3).

Case XII.—Age of patient, 23. Occupation, milkman. Type of goitre, uniform parenchymatous; small nodular mass in isthmus. Circumferential measurement of neck, 42 cm. Duration of disease, "about one year." Treatment, vaccine from Case XI. Number of inoculations, seven. Duration of treatment, fifty-six days. Result, complete disappearance of the goitre with the exception of the small nodular mass in isthmus. Final measurement of neck, 37.5 cm. Diminution in circumferential measurement of neck, 4.5 cm. The patient followed his usual avocations during the whole course of treatment. (Chart 4, fig. 4.)

At this stage of my observations I had in hospital four cases of caries of bone. I had obtained from each of these a staphylococcus, the vaccine prepared from which had proved highly efficacious in causing the bone to heal and the sinuses to close. It occurred to me to use this staphylococcic vaccine in the treatment of goitre. I consequently administered it in four cases. The initial dose was in each case 250 million; the inoculations were made at intervals of a week to ten days. In two cases the result was practically *nil*, but these were cases—one adenomatous, the other cystic—in which no form of medicinal treatment could have been of use. The other two cases, however, responded to the treatment in a highly satisfactory way. The following (Case XXIII) is one of these cases.

Case XXIII.—Age of patient, 35 (?). Occupation, policeman. Type of goitre, uniform parenchymatous. Circumferential measurement of neck, 39 cm. Duration of disease "about two years." Treatment, staphylococcic vaccine; the staphylococcus was obtained from a case of caries of the femur. Number of inoculations, five. Duration of treatment, sixty days. Result, complete disappearance of goitre. Final measurement of neck, 36 cm. Diminution in circumferential measurement of neck, 3 cm. The patient carried on his work as a policeman during the whole course of treatment. (Chart 5, fig. 5.)

About this time an Australian pony, recently imported into Gilgit, was found to be suffering from goitre. The swelling was right-sided, about the size of a hen's egg, and was of not more than three weeks'

standing. I isolated from the fæces of this animal a spore-bearing organism, the characters of which I have recorded in another place [4]. This organism was also commonly met with in cultures made from human fæces. Having satisfied myself, by the inoculation of small

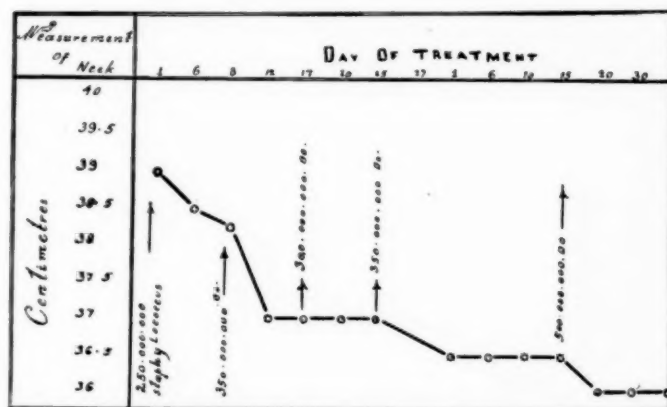


CHART 5.

Showing measurements of neck at various stages of treatment, also doses and times of administration of vaccines.



FIG. 5.

Case XXIII. Diminution = 3 cm.

quantities of live cultures into animals, that its introduction under the skin gave rise to no ill-effects, I employed a vaccine made from this bacillus at the Pasteur Institute of Kasauli in the treatment of two selected cases of goitre. Here again the result was satisfactory. Case XXXIII is one of the cases treated in this way.

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Case XXXIII.—Age of patient, 23. Occupation, cultivator. Type of goitre, parenchymatous; two small tumour masses in right lobe. Circumferential measurement of neck, 41 cm. Duration of disease, "over a year." Treatment, vaccine prepared from spore-bearing organism referred to in text. Number of inoculations, four. Duration of treatment, forty days. Result, disappearance of goitre with exception of two tumour masses in right lobe. Final measurement of neck, 37.5 cm. Diminution in circumference of neck, 3.5 cm. The patient carried on his work as a cultivator during the whole course of treatment. (Chart 6, fig. 6.)

Forster's dysentery vaccine was then tried in two cases, but without any beneficial result. One of these subsequently responded to vaccine with the composite vaccine referred to at the beginning of this paper.

I have treated thirty-three cases of simple goitre by means of vaccine. The cases were selected cases. The results observed may be summarized as follows: Of the four vaccines which were successfully employed the "composite" vaccine appears to be the best, though, as will be seen from the photographs and charts which illustrate this paper, the other three vaccines have given excellent results. I have found an initial dose of 150 million to be most suitable in the case of the composite vaccine and in the case of that prepared from the coliform bacillus referred to. There is usually some rise of temperature a few hours after the inoculation, but this is rarely of any severity if the initial dose does not exceed 150 million. Subsequent dosage can be readily regulated by the effect of the treatment on the enlarged thyroid. When the gland begins to soften and the skin over it becomes lax the dose which has brought about the result will not need to be increased at subsequent inoculations. I believe, also, that the volume of the vaccine inoculated should be small, and that it is better to introduce 150 million of the bacteria in 5 minims of salt solution than in 1 c.c. of the same. The local reaction does not then appear to be so marked, and when the upper arm is selected as the site of inoculation the patient is usually able to follow his ordinary avocation with no more loss of time than that necessary to attend at the laboratory for the treatment.

Cases vary considerably as to the number of inoculations which are necessary to effect a cure. As a general rule, it may be said that the older the goitre the larger the number of inoculations which will be needed. I have had several cases in which the thyroid swelling has entirely disappeared after two or three inoculations (Case V, fig. 1). As a rule, however, from four to seven inoculations were found to be necessary.

This treatment is suitable for cases of recent parenchymatous goitre, and its value is confined to such cases. It has little or no effect where the goitre is of long standing—that is to say, when the main part of the swelling is made up of adenomata or of cysts. In some cases a shrink-

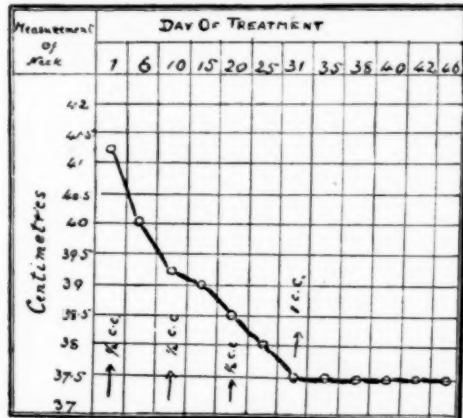


CHART 6.

Showing measurements of neck at various stages of treatment, also doses and times of administration of vaccines.



FIG. 6.

Case XXXIII. Diminution = 3.5 cm.

ing of the thyroid tissue around adenomatous or cystic masses is observed, but no diminution in the size of these masses has been noted to occur.

All my patients have commented on the feeling of *bien être* to which this treatment gives rise, and so popular had it become—by reason of

its simplicity and its freedom from restrictions of diet, &c.—before I left Gilgit, that my last five or six patients asked for it in preference to any other. I have usually employed an autogenous vaccine, though I have obtained excellent results by using the vaccine of one patient for the treatment of another (Case XII, chart 4, fig. 4).

With this treatment—as with the treatment of goitre by thymol, iodine, or the *Bacillus bulgaricus*—the patients, as a rule, lose flesh, and the skin becomes of a healthier tint. I am of opinion that the loss of flesh is to be thus explained: The toxic agent of the disease is destroyed or inhibited in its action by the vaccine, or by the internal medication; in consequence, the secretion of the hypertrophied organ is for a time in excess of the demand. The excess of secretion, therefore, which continues to be thrown into the blood-stream, until such times as the gland regains its normal equilibrium, exerts its influence in increasing the metabolic processes of the body, and a loss of subcutaneous fat is the result.

It will, perhaps, be remembered that I have produced goitre experimentally in man by the administration of matter separated from a goitre-producing water by means of a Berkefeld filter [2], [3]. I repeated this experiment in five young men whose goitres had been cured by vaccination. In no case did the thyroid gland show the slightest increase in size, though the five individuals consumed the “suspended matter” for a period considerably longer than the subjects of my original experiments. It is possible, therefore, that these men may have been in some measure protected by this vaccination, since having once suffered from goitre they would have been more likely to acquire it than individuals who had not been previously so afflicted.

Now there arises out of this treatment of simple goitre the problem that vaccines prepared from no less than three bacteria—namely, a coliform bacillus, a spore-bearing bacillus, and a staphylococcus—have been employed with success in causing the hypertrophied thyroid to return to its normal size. The solution, I believe, is to be found in an application of Metchnikoff's discovery that certain microbes of our normal intestinal flora are harmful by reason of the poisonous substances which they produce in the intestines. These organisms are of the coli group, certain spore-bearing organisms, and the staphylococcus. By their action on proteid foodstuffs they produce poisons—indols and phenols—which are absorbed by way of the intestinal wall and give rise to fibrotic changes in the liver, kidneys, and arteries. It did not occur to Professor Metchnikoff to note the action of these poisons on the

thyroid gland, though he concluded that they exercised a harmful influence on most of the organs of the body [5].

The vaccines that I have employed were prepared from organisms similar to these normal and harmful inhabitants of the intestines. There is at present no evidence that any one of these possesses a specific influence in the production of goitre. The conclusion, therefore, is suggested that the thyroid gland is called upon to combat several poisons normally present in the human intestine. When to these is superadded the specific virus of goitre an abnormal element is introduced, and an extra strain is thrown upon the gland. Unassisted, it undergoes hypertrophy in many cases, but if assisted in any one direction it is capable of performing the additional task which has been imposed upon it, and of combating the abnormal virus. On the assumption that no one of the different vaccines which I have employed contains the specific organism of goitre, my explanation of their action in this disease would be that they cause the disappearance of the goitre by relieving the thyroid of part of its normal work, thus enabling it, without continuing in a state of hypertrophy, to destroy the specific toxin of goitre.

The vaccine treatment of goitre which I have described leads us to two important conclusions. In the first place, it confirms the view of the ætiology of the disease which I enunciated several years ago—namely, that goitre is due to the presence of a living organism of disease in the intestinal tract [1], [2]; and secondly, it demonstrates that the thyroid gland is markedly influenced by the nature of the bacterial flora of the intestine, and that one of its chief functions is to protect the body from the many toxic substances which find their way into the blood-stream from the alimentary tract. This latter conclusion is substantiated by some experimental work which I have lately published [4]. The experiments show that the thyroid glands of goats undergo marked changes as a result of the continued contamination of their food with cultures of micro-organisms grown from the fæces of goitrous individuals.

Now, apart from the significance which attaches to the action of vaccines on the hypertrophied thyroid when considered in relation to the ætiology of goitre, I desire to emphasize the importance of the antitoxic action of thyroid mechanism. Assuming the accuracy of the second of my conclusions, we at once appreciate the *raison d'être* of this mechanism in the human economy. We realize that the gland undergoes hypertrophy as a result of a definite stimulus, which is commonly

toxic material absorbed from the alimentary tract, and also that the enlargement is not an evidence of derangement of the organ's function, but of its effort to resist some toxic agency. For my own part, I believe that the nervous and other degenerative changes which follow as a result of thyroid incompetency are due to the action of poisonous substances absorbed chiefly from the alimentary canal. These poisons, by reason of the functional imperfection of the thyroid, are allowed free play on the unprotected tissues of the body, and such conditions as tetany, cretinism, and myxœdema are the result.

I claim that my researches on the ætiology of goitre have established the importance of the antitoxic action of the thyroid mechanism, and I would venture to suggest that future researches upon its diseases should take this action as their fundamental basis.

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DISCUSSION.

Dr. LANGMEAD remarked that those who had followed Captain McCarrison's work for some time felt sure that the present paper would be of interest. When the author opened up the question of the influence of the thyroid secretion and the value of the thyroid activity in cases of toxæmia, it would be agreed that he entered upon a very broad and intricate subject. He (the speaker) would mention three classes of case in which the thyroid gland appeared to exert a specific influence in preventing intoxication. The first comprised cases of pregnancy and uterine function generally; the second cases of rheumatoid arthritis; and the third cases of tetany. It was known that the thyroid was associated with uterine functions; it had been supposed that the thyroid enlargement was something more than simply an accompaniment of an enlargement of the ovary, and that it was actually antagonistic to an agent which was in the circulation at the time. The thyroid enlarged at the monthly periods (which were said to be abortive pregnancies) and at the beginning of the period of ovarian activity. It also enlarged during pregnancy, and when the uterine activity came to an end—i.e., at the climacteric—thyroidal difficulties often began. It had been supposed there

was in pregnancy a reaction due to an agent which was produced by the chorionic villi, and it was possible that the thyroid was responsible for counter-acting it. This "pregnancy reaction" might even go on after the child was born. The secretion of the breasts, which occurred in practically all newly born children, vaginal hæmorrhage in newly born girls, and prostatic enlargement which occurred in many newly born boys, were also supposed to be evidences of "pregnancy reaction" acting in the blood of the infant which it had obtained from the mother. The second example of thyroid activity in cases of toxæmia which he would mention occurred in rheumatoid arthritis. There was much evidence of association between the two, and cases had been recorded in which the administration of thyroid had considerably improved rheumatoid arthritis. There were cases in which exophthalmic goitre and rheumatoid arthritis went side by side, and there were many signs which might be considered as evidence to show that rheumatoid arthritis was an intoxication from the alimentary tract. It was said that the value of some of the methods of treatment, that by guaiacol especially, had been due to their bactericidal action on the contents of the intestinal tract. With regard to tetany, which Captain McCarrison had mentioned, that condition usually occurred in children in whom there was something definitely wrong with the intestinal tract; practically always there were offensive motions before the tetany came on. There were cases in adults in which tetany occurred as the result of gastric dilatation, and Bouveret and Dévic had isolated a toxin which caused tetany from the gastric contents. He had published some cases himself of children who had a very chronic and relapsing form of tetany associated with dilatation of the colon. In those cases the dilated bowel was apparently analogous to the dilated stomach in adults. All these points were but a few examples of many others which bore on the question of thyroid activity and toxæmia.

Dr. F. PARKES WEBER remarked that if the author's explanation of his satisfactory results by the vaccine treatment was correct, the nature of the the goitre in those cases which he dealt with in his paper must have been a compensatory enlargement of the gland, with the object (if one might be permitted to speak in teleological terms) of counteracting certain poisons produced in the intestines by various microbes. If that were so, it seemed probable that had Captain McCarrison treated those same patients with thyroid substance he would have equally well succeeded in producing a diminution of the goitre. He asked Captain McCarrison whether thyroid treatment had been tried in patients similarly affected, and if so, with what results. He thought it was obvious that the same class of patients ought to be treated in that way to see whether the author's explanation held good. Had such patients been treated with thyroid extract, and had the goitre shown no diminution, that fact would have constituted a rather strong point against the correctness of Captain McCarrison's explanation of the results of his vaccine treatment.

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Mr. JAMES BERRY said that the author's work had been known to him for the past eight or nine years, and he had great admiration for it. Those who took an interest in the causation of goitre were coming round to the view that a large proportion of cases of parenchymatous goitre were due to some toxic influence, and the idea that it was due to a mineral constituent in the water consumed was gradually being exploded. Whatever the nature of the poison, it must be something suspended, not dissolved, in the water. Treatment by vaccine was somewhat out of his province as a surgeon, and it was with hesitation that he ventured to speak among physicians on a matter which was regarded as purely medical, and he held that the treatment of parenchymatous goitre was essentially medical. There was always a residuum of cases which the surgeon was called upon to treat, namely, those which did not yield, as did most parenchymatous goitres, to ordinary medical treatment by iodine, arsenic, or thyroid extract; and it was to be hoped that Captain McCarrison had added another and most important means of treating the disease. No surgeon willingly operated upon parenchymatous goitre, and except in cases of extreme urgency, he did not operate upon it, as a rule, until medical treatment had been tried in vain. Surgeons would be very pleased if it should be found that parenchymatous goitre could be successfully treated by vaccines. Of course, no one expected that vaccine treatment, or thyroid extract, or iodine, or any other medicament, would touch a case of adenoma; such always required treatment by surgical means. Captain McCarrison was in agreement with him on that point. The author spoke of hypertrophy of the gland, and he understood him to use the terms "hypertrophy" and "parenchymatous goitre" as if they were synonymous. He (Mr. Berry) thought that what was called parenchymatous goitre was not a true hypertrophy; it was quite different, for example, from the compensatory hypertrophy that was met with after unilateral removal of a thyroid lobe, where true increase of cells occurred. It was quite different from the goitre of Graves's disease where there was a great increase in the number of cells. Strictly, it would be much more correct to speak of parenchymatous goitre as an atrophy of the gland rather than as hypertrophy. It was a pathological condition, in which the gland was enormously distended with secretion, which was stagnant. There was no evidence that the cells were multiplied, and probably they were actually atrophied. In thanking the author for his paper, he expressed the hope that he would continue his researches on the subject.

The PRESIDENT (Dr. Frederick Taylor) said it occurred to one, when a disease had been successfully treated by certain methods, and then another efficacious method was discovered—as appeared to be the case in the instance now under discussion—to ask whether there was some common feature or element in those different methods which operated to produce a cure? He would be glad to hear whether Captain McCarrison had thought of such common factor in investigating this disease; whether he could link up the influence of thyroid extract, arsenic and iodine with that of the vaccines. Dr. Parkes Weber's question about the action of thyroid extract in curing

goitre suggested that he held a different view of the disease from Mr. James Berry, who represented the thyroid as not being hypertrophied, but atrophied. Perhaps that point could be explained by the author in his reply.

Dr. ROBERT HUTCHISON asked how long the beneficial effects lasted, and whether there had been any indications of a return of the goitre some time after the vaccination. It was necessary to be on one's guard in accepting theories based on a supposititious intestinal toxæmia. Such an idea was far too current as an hypothesis in modern medicine. He was rather sceptical about intestinal toxæmia, and did not think there was much actual evidence supporting it. Nature did not provide an alimentary tract containing bacteria and not provide also, in the liver, a sentinel which stood at the exit of the portal system, to deal with the poisons which the intestinal tract produced. He did not deny Captain McCarrison's results, because the photographs confirmed them, but he approached the explanation he advanced with scepticism. He was surprised to hear Mr. Berry say that a parenchymatous goitre was to be regarded as atrophic, because that made it very difficult to explain the benefit which the administration of thyroid effected in parenchymatous goitre. The natural explanation of such beneficial action was as follows: The goitre was a response to an increased demand for thyroid secretion, and one supplied that demand artificially by sheep's thyroid, and the hypertrophied gland immediately subsided. He thought one could explain in this way the cases of hypertrophy of the thyroid to which Dr. Langmead referred—i.e., hypertrophy during the menstrual period, pregnancy, &c. One could explain them just as well on the assumption that there was, at those times, an increased demand for thyroid tissue because metabolism was more active, as upon the antitoxic hypothesis.

Dr. CROOKSHANK said he would be interested to hear more about the kind of goitre which was prevalent in Gilgit. Apparently all Captain McCarrison's cases treated by vaccines were in men. Did goitre in Gilgit tend to disappear spontaneously? He believed there was some confusion between increased size of the thyroid and increased functional activity of that organ. Among the speakers there seemed to have been some misconception which centred around the undoubted difference between parenchymatous goitre and true hypertrophy of the thyroid gland with increased functional activity.

Captain MCCARRISON, in reply, said the vaccine treatment he had now set forth was to be regarded as only one of his steps towards the final elucidation of the mystery as to the cause of goitre; he did not set it up as better than any other treatment of the goitre. In answer to Dr. Hutchison, he commenced his work in the winter of 1909, and when he left Gilgit two years later none of those vaccinated showed any signs of a return of the condition. Pregnancy and menstruation were admittedly two contributing causes, and women and girls were more liable to goitre than men. These cases were eminently suitable for treatment by thyroid extract. He had not observed

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diarrhoea in the cases, and did not give purgatives. The men were not in hospital, and came as extern patients; they went about their ordinary occupations. He thought the common mode of action of the various remedies was to assist the thyroid gland in a tight place. Thymol, for example, was an intestinal antiseptic, and it did not enter the blood-stream unless given in solution; the drug must, therefore, act by destroying the toxic agent of the disease in the intestine. He had also employed the *Bacillus bulgaricus*, and the mode of action of that was known. There were several very strong arguments in support of his view that the disease was due to a living organism in the intestinal tract. First, it was spread by water, and the intestine would be the natural place to find it. Secondly, it was curable by intestinal antiseptics and by the lactic acid bacillus; and thirdly, it was curable by the vaccines he had employed. The thyroid also was a protective agent against toxic substances absorbed from the bowel as well as the liver. In answer to Dr. Crookshank, goitre was no different in Gilgit from that anywhere else. At first there was a uniform swelling, which afterwards became degenerated and contained many adenomata. Cretinism was very common in Gilgit. He had read a paper before this Section¹ in which he showed that goitre occurred in 40 per cent. of all cretins, so that in 60 per cent. there was no goitre. Twenty per cent. of the men in the troops which came to Gilgit developed goitre shortly after their arrival; he had seen one or two of these cases among the troops which seemed to have got well spontaneously. In some experiments which he did on himself and other men, after they had drunk the suspended matter separated from the goitre-producing water by a Berkefeld filter, it was noticed that 40 per cent. of the people who got swellings recovered of themselves; in the remaining 60 per cent. the swelling was permanent; but in none of them was the goitre as large as he had shown that evening.

¹ *Proceedings*, 1909, ii, pp. 1-36.

Medical Section.

March 26, 1912.

Dr. FREDERICK TAYLOR, President of the Section, in the Chair.

A Case of Angina Abdominis.

By Sir LAUDER BRUNTON, Bt., M.D., F.R.S., and
WILLIAM EDWIN WILLIAMS, F.R.C.S.Ed.

THE case we are about to describe is one in which the patient suffered from severe pain which came on when he began to walk. In this respect the pain resembled that of angina pectoris, but it differed in its position as it was most severe in the umbilical region. It was at first confined to the umbilical region and was attributed to flatulence, but it gradually increased in severity and extent so that it spread all over the front and back of the chest and caused perspiration to break out over his body. The patient, with whose permission we publish the case, was under the care of one of us (Mr. Williams), who thus describes it.

The patient was aged 68, a widower, with one child. He had been suffering from glycosuria for twenty-five years. For the last six years he had been under the care of the late Dr. Pavy. When he first consulted Dr. Pavy six years ago his urine contained 4 per cent. of sugar together with acetone and diacetic acid, but after taking Dr. Pavy's medicine and living upon a diet restricted to proteid food the urine lost all evidence of sugar, acetone, and diacetic acid — when Dr. Pavy ordered him to take 2 oz. of bread daily. After a while this caused the reappearance of sugar, upon which Dr. Pavy cut off the bread and ordered him to exclude the further use of sugar and starchy food, since when he has adhered to the rigid diet and has taken the pills twice daily. The following is a copy, as far as I remember, of Dr. Pavy's prescription given to him, on the first occasion of the patient's visit to him:

R Codeinæ gr. $\frac{1}{4}$, extract. nucis vom. gr. $\frac{3}{4}$, extract. cascariæ sagradæ

gr. $\frac{1}{2}$, to be made into one pill; send twelve; take one twice daily shortly after breakfast and at bedtime. Let successive sets of twelve pills follow with gr. $\frac{1}{2}$, gr. $\frac{3}{4}$, and gr. 1 of codeine, the pills with the last-named dose to be afterwards continued—the dose of cascara to be raised if necessary for the bowels—which was done without producing any alteration in the constipation. The patient still continues taking two 1-gr. doses of codeine pills every night and morning, and with the exception of a plate of porridge with 6 oz. of milk daily his diet consists of cream, Callard's prolacto biscuits, butter, cheese, fish, chicken, game, beef and mutton, with sugarless marmalade. The patient's obstinate constipation is still unrelieved except by the continuous use of aperients or enemata. Carlsbad salts require to be taken in increasingly large doses in order to produce a result. In May, 1911, he went to Vichy, where he put on 5 lb. in weight, and after his return home he gained a further 3 lb. within two months. About the early part of August the flatulent pains, which had been troubling him to a bearable extent during the previous eighteen months became unendurable, and since the appearance of these pains he lost all the flesh he had gained since May. One marked feature in his case has been excessive drowsiness. This tendency to fall asleep has existed for two years. Whenever he gets into a condition for repose at home for reading, after a while he is found to be fast asleep.

He was sent up by Mr. Williams to Sir Lauder Brunton for consultation, who saw him on October 20, 1911, and found the tongue clean, rather dry, the appetite fair; there was a little distension, and much flatulence which passed both up and down. There was no nausea. The bowels were very constipated and the motions were pale yellow. The urine was rather dark, clear, acid; specific gravity between 1028 in the evening and 1024 in the morning. There was no albumin. There was slight reduction with Fehling's solution, but this was due to normal reducing bodies and creatinin, a mere trace of glucose being present, as proved by the fermentation test. The lungs were quite normal. The heart was in the fifth space, the deep dullness was a quarter inch inside the nipple line, and there was no murmur either at the apex or base. The pulse was 112, regular, but it was, no doubt, quickened by nervousness. The systolic tension was only 115 mm. of mercury and the diastolic 65 mm. Some bismuth and soda were prescribed for the flatulence and some Carlsbad salts to be taken every morning to keep the bowels open.

As the patient had been losing weight, both Sir Lauder Brunton and

Mr. Williams thought it would be advisable for him to take more carbohydrates, and consequently asked him to try oatmeal and also some petroleum emulsion. On November 25 another specimen of his urine had a specific gravity of 1013. The reducing power of this urine before fermentation was 3.33 parts per 1,000. Of this only 1.55 was due to glucose, equal to 0.68 gr. per oz., but 1.78 parts were due to the other reducing bodies, creatinin, &c. The most striking feature in the case was the severe spasmodic pain of which the patient complained. As this pain resembled so closely that of angina pectoris, but occurred in the abdomen, it seemed to Sir Lauder Brunton that it might well be termed angina abdominis, and that treatment similar to that of angina pectoris might be useful. He accordingly prescribed trinitrine with the most satisfactory results, as it cut short the abdominal pain in the same way as it would have cut short anginal pain in the chest.

On December 2, 1911, the patient expressed very great satisfaction in having a remedy (trinitrine tablets) to control the pains of angina abdominis. These occurred about twice daily, mostly after walking exercise, but playing billiards brought them on. His sister, aged 64, unmarried, has suffered during the past seven years from abdominal pains similar in every respect to the pains felt by the brother. They are felt in the same spot and come on after walking, and are immediately stopped by taking half a tablet of trinitrine.

When Sir Lauder Brunton saw the case he was unaware that the term "angina abdominis" had already been used some years ago. On looking up the literature he found that Baccelli is said by Minella [6] to have first used this term in his clinic at Rome. Minella himself described a case in 1902, and in his paper says "that the abdominal spasmodic pain may be due to aneurysm or arterio-sclerosis of the vessels of the coeliac plexus." The subject is very fully discussed under the name of "angina abdominis" by Professor J. Pal in his book on "Gefässkrisen" [7] as well as in several other papers [8]. It is also discussed by Huchard under the name of "angina pectoris pseudo-gastrique." [2]

It is now many years since the late Professor Dreschfeld, of Manchester, in a conversation on the subject of abdominal pain, mentioned a case in which he had noticed severe paroxysmal abdominal pain. After the death of the patient, nothing abnormal was found to explain this symptom excepting a very atheromatous condition of the intestinal vessels. Sir Lauder Brunton mentioned this observation in a paper about twelve years ago [3], but cannot find that Professor Dreschfeld

himself published anything on the subject either before or since. In this paper Sir Lauder Brunton described a condition of pain coming on in the abdomen, spasmodic in its nature and occurring for a limited period. In such cases "the bowels may be perfectly regular, the digestion good in every respect, the health of the individual may appear to be perfect, and yet he suffers frequently from this abdominal pain." These pains he (Sir Lauder Brunton) attributed to spasmodic irregular contraction of the intestinal vessels, such as he has had occasion to observe in migraine. He has had opportunities of studying the vascular phenomena in migraine only too frequently in his own head, and he finds that pain in migraine is invariably due to proximal dilatation and peripheral contraction of the temporal artery [4]. That the pain in migraine is due to the tension in the contracted artery is shown by the fact that it ceases at once when the carotid is compressed, but returns at once when the circulation is re-established. In this paper he advised the use of salicylate of soda and bromide of potassium as a remedy for the abdominal pain just as in migraine [5], along with carminatives and friction of the abdomen during the attack. In Pal's case of angina abdominis there was high blood-pressure, and in some of them angina pectoris occurred at the same time or might occur alternately with the angina abdominis. Many of Pal's cases suffered from tabes, and he considers that in this disease there are two sorts of crises [9]. The first is purely gastric, and in it vomiting occurs either with or without pain, but the blood-pressure does not rise much. The second sort consists of vascular crises which are associated with pain and with high tension. In such cases the pain comes on as the pressure rises and is relieved by lowering the pressure by nitrate of amyl or nitrites, just as in angina pectoris or as in the case we have described. This observation has been confirmed by Heitz and Norero [1]. The most distinguishing feature in the present case is the occurrence of pain on exertion, which is so characteristic of angina pectoris, and this peculiarity does not appear to be noted in the cases described by Pal and others.

As most of the cases recorded by others have shown symptoms of locomotor ataxy, it seemed advisable to ascertain the condition of the knee-jerks and of the pupils in the patient and his sister. This was done by Mr. Williams, who finds the knee-jerks of the patient's sister are normal, but the pupillary reflexes are sluggish, with pupils much contracted beyond what they ought to be. "The patient's knee-jerks," he says, "are abnormally active, the pupils in his case are a good deal contracted, and almost insensible to a bright light."

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- [3] LAUDER BRUNTON. "On Abdominal Pain," *International Clinics*, 8th series, Lond., 1899, iii, p. 111; reprinted in "Disorders of Assimilation," 1901, pp. 250 et seq.
- [4] *Idem*. "Pathology and Treatment of Headache," *St. Bartholomew's Hosp. Reports*, 1883, xix, pp. 329-41; reprinted in "Disorders of Digestion," 1886, p. 103, and "Hallucinations," &c., *Journ. of Ment. Sci.*, 1902, xlviii, pp. 226-61.
- [5] *Idem*. *Practitioner*, 1894, lii, p. 101; reprinted in "Disorders of Assimilation," p. 320.
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- [7] PAL, Professor J. "Gefässkrisen," Leipz., S. Hirzel, 1905.
- [8] *Idem*. *Wien. med. Wochenschr.*, 1904, liv, p. 570-74.
- [9] *Idem*. "Zur Kenntniss der abdominalen Gefässkrisen der Tabetiker und ihrer Beziehung zur 'Aortite Abdominale,'" *Med. Klin.*, Wien, 1908, iv, p. 1790, and numerous papers for which he gives references in his book on "Gefässkrisen."

DISCUSSION.

Dr. F. PARKES WEBER said that comparatively little had been written on this subject in England, but abroad there was a very extensive literature on the various conditions in question. The nomenclature was also varied. One of the names (Ortner) by which "abdominal angina" was known was "dyspragia intermittens angio-sclerotica intestinalis." If it were chiefly gastric, "gastrica" could be substituted for "intestinalis." One kind of angio-sclerotic symptom-complex sometimes met with in persons past middle life, with evidence of some general arterio-sclerosis and rather high blood-pressure, resembled the crises which occurred in (generally younger) patients who were subject to what was called "colica mucosa"; in them there was very severe abdominal pain, and a desire to defecate, but often nothing occurred except the ejection of a little mucus. After a time the abdominal pain ceased. This disappearance would doubtless be favoured by the patient taking a hot hip bath. He recently saw a man past middle age who had somewhat high blood-pressure, and some symptoms of general arterial sclerosis. He was of Jewish descent, and doubtless had the well-known racial predisposition to neurosis. Sometime ago, that gentleman used to suffer from pains in the region of the heart, which suggested angina pectoris. They were probably largely of nervous origin, without sufficient arterio-sclerotic changes to constitute "true" angina pectoris. These symptoms disappeared, possibly independently of small doses of trinitrin, which were at one time prescribed. He had lately, however, suffered from crises of abdominal pain, and in some of them there was the desire to evacuate his rectum, followed by the passage of mucus without regular faeces. Many varieties of the symptoms supposed to be due to abdominal angio-sclerosis had been described abroad. An elaborate paper was that by Norbert Ortner, of Vienna, in 1903, entitled

"Zur Klinik der Angiosklerose der Darmarterien."¹ Another large contribution was one by F. Perutz, of Munich,² who gives references to the previous literature on the subject. Many other accounts had been published in Germany and France,³ but few cases had yet been described in England. Exact information as to the anatomical-pathological conditions corresponding to the clinical symptoms in the various classes of cases was still needed. Therapeutically, diuretin seemed to have a large reputation abroad, but he did not know whether its use had been confirmed in England for symptoms supposed to be due to abdominal angio-sclerosis.

Dr. CROOKSHANK said that, as Dr. Parkes Weber had alluded to the scanty anatomical findings for this condition, he would like to allude to a case which occurred within his experience last summer. An elderly woman for a year had had recurrent attacks of pain, similar to those described by Sir Lauder Brunton. The pains became worse, and an acute illness developed with vomiting, and other signs which led to the belief that there was intestinal obstruction due to impaction of faeces. She was removed to hospital. At first she improved, but later she became worse and died. Post mortem, the pancreas was found to be lying loose, as a necrotic mass, and Dr. Bernstein, who made the post-mortem examination, pointed out that the pancreatic artery was almost obliterated by arterio-sclerosis, and that there was extensive arterio-sclerosis of the celiac axis generally. These findings suggested that the attacks of pain from which the patient had suffered were really those of "angina abdominalis," and that intermittent claudication of the pancreatic artery went on to gangrene of the pancreas, in the same way as intermittent claudication of femoral arteries went on to gangrene in the legs. He thought that retention of the term "intermittent claudication" was best on the whole; it seemed to bring various groups of cases into relation with each other, and covered those with spinal symptoms; "claudication of the cord" as well.

Dr. PARKES WEBER, referring to the remarks of Dr. Crookshank, said, "claudication" meant limping, which was scarcely applicable to gastrointestinal conditions, and that was why the term "dyspragia" had been by some preferred to "claudication."⁴

¹ *Sammlung Klinischer Vorträge*, Neue Folge, No. 347, Leipz., 1903. See also the account by Warburg, *Münch. med. Wochenschr.*, 1905, lii, p. 1174.

² "Ueber abdominale Arteriosklerose (Angina abdominalis) und verwandte Zustände," *Münch. med. Wochenschr.*, 1907, liv, pp. 1075, 1135.

³ Many references are given by L. Lagane, "Le Syndrome arterio-scléreux de l'Intestin," *Presse Médicale*, Par., 1911, p. 1025.

⁴ Even in regard to the condition in the lower extremities the term "intermittent claudication" (intermittent limping) was not so suitable, when first used by Charcot in human cases, as it had been in the case of horses. A patient with typical symptoms objected to Dr. Weber: "But I never limp: I have to stop walking, and then after a short rest I can walk on again."

The PRESIDENT (Sir Frederick Taylor) said he would like to reject the word "angina" as well as "claudication," for the former meant suffocation, and so was inaccurate in this connexion. Professor Huchard's name, "angina pectoris pseudo-gastrica," seemed also to be a misnomer, which it was to be hoped could be avoided. But once such a term as "claudication" had taken root it was difficult to get rid of it. He asked whether Sir Lauder Brunton associated the intercurrent pains which occurred in the course of diabetes with the severe abdominal pain which often occurred at the commencement of diabetic coma. Acute pain of this kind had, more than once, laid the patient on the operating table. He did not know whether anyone had yet fully explained the early abdominal pain occurring in diabetic coma. The post-mortem record related by Dr. Crookshank was very interesting because it seemed to confirm the idea that the pains described by Sir Lauder Brunton were due to arterio-sclerosis. And when one knew that the gangrene of the lower extremities which occurred in diabetes was also due to unnaturally early arterio-sclerosis, the whole series of pathological conditions seemed to be consistent.

Sir LAUDER BRUNTON, in reply, said he did not attempt to defend the name he had used, and yet it was a convenient term. One of his great difficulties in connexion with the subject had been adequately to trace the literature of it, as there being so many different names, he hardly knew under what heading to search for contributions. The term might be bad, but like another term equally bad—namely, apoplexy—it was in very common use, though he admitted that it was no defence to point to another bad term. Baccelli was responsible for the term, for he gave the condition that label first, though what he (Sir Lauder) wrote twelve years ago was among the first descriptions. The first account he had been able to find was that which Dreschfeld gave him nearly twenty years ago, namely, of a case in which pain occurred but in which after death nothing was found to explain it except an atheromatous condition of the abdominal vessels. In the paper which he (the speaker) wrote twelve years ago he pointed out the likeness between the pains in the abdomen and the pains in the head, attributed them to the same cause, and sought to treat them by the same remedies. He had not seen the papers to which Dr. Parkes Weber referred. The case mentioned by Dr. Crookshank, in which the pancreatic artery was obliterated, was very interesting in relation to these cases, and no doubt many others would be recorded when once attention had been directed to the subject. The point in which the case differed from most others was that the pain did not come on apparently in consequence of any intestinal irritation, such as happened in the cases mentioned by Dr. Parkes Weber in which mucus was expelled from the intestine, showing that there was some intestinal catarrh. But in his own case there was no intestinal catarrh; the pain came on immediately after exertion, such as walking, though even a game of billiards would start it. The pain did not occur at any other time. The case was so peculiar that he thought it was worth while to place it on record.

Functional Hour-glass Stomach.

By ARTHUR F. HERTZ, M.D.

THE diagnosis of hour-glass stomach is rightly regarded as one of the greatest triumphs of radiography. Before the introduction of bismuth meals, the condition was very rarely recognized before an exploratory operation or an autopsy revealed its presence. Though numerous signs of hour-glass stomach have from time to time been described, not one of them is pathognomonic, and all of them may be absent in quite well marked cases. Thus in one patient, in whom the diagnosis had been definitely made with the aid of the X-rays, and in whom it was subsequently confirmed at operation, none of the seven signs collected together by Mr. Moynihan in his exhaustive paper [7] on hour-glass stomach published in 1904 could be elicited on repeated examination.

Although in every case of organic hour-glass stomach the diagnosis can be made with far more ease and far more certainty with the X-rays than by any other method, a small number of cases have been reported and a large number remain unrecorded, in which the diagnosis made after an X-ray examination has not been confirmed at the subsequent operation. This is due to the fact that an hour-glass stomach may have a functional origin; it may be quite obvious when the patient is examined under natural conditions with the X-rays, although no evidence of its presence can be found either at operation or after death.

I believe that there are at least three different forms of functional hour-glass stomach. The existence of one of them was already suspected before the introduction of radiography, but our knowledge of its aetiology and significance is due mainly to the X-ray investigations of Barclay in England and Jollasse and Jonas on the Continent. The other two forms of functional hour-glass stomach were first described by myself in a paper published in September, 1910, in the *Archives of the Röntgen Ray*.¹ I propose this afternoon to describe these three functional forms and to indicate how they can be distinguished clinically from the organic hour-glass stomach.

(I) SPASMODIC HOUR-GLASS STOMACH.

Jollasse [5] in 1906 expressed his belief that the typical X-ray appearance of an hour-glass stomach could result from spasm. The more

¹ *Arch. of the Röntgen Ray*, 1910, xv, pp. 127-31.

recent investigations of Barclay [1] and Jonas [6] have conclusively proved that this is indeed the case, and that spasmodic hour-glass stomach is not a very rare condition. It is most frequently due to the presence of an ulcer, which is generally situated on the lesser curvature and may be quite small. In some of Barclay's cases no ulcer was found at an exploratory laparotomy, but Härtel [4], in a report from Professor Bier's clinic, states that one was present in all of his cases, although in some it only involved the mucous membrane and would have been missed if the stomach had not been examined from inside as well as

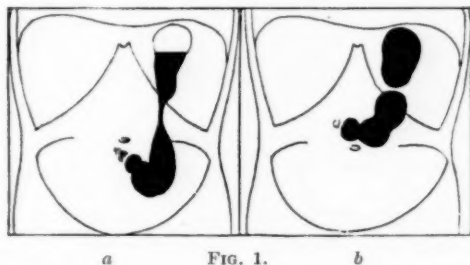


FIG. 1.
Spasmodic hour-glass stomach, due to a gastric ulcer: a, standing; b, lying.

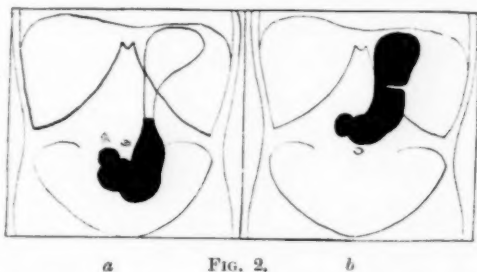


FIG. 2.
Spasmodic hour-glass stomach, due to a gastric ulcer: a, vertical; b, horizontal.

from outside. The neck of this form of functional hour-glass stomach passes from the lowest point of the upper segment, as it does in the orthostatic form, which I shall describe directly, but it differs from the latter in that it persists on lying down (fig. 1). In some cases, indeed, the spasm leads to a curious narrow depression on the greater curvature, seen in the horizontal position, although nothing more than a slight narrowing in the body of the stomach is visible on standing (fig. 2). The spasm can sometimes be caused to disappear by abdominal massage

(Barclay), by vigorous voluntary contraction of the abdominal muscles (fig. 3), and less frequently by the injection of $\frac{1}{100}$ gr. of atropine (Rieder [8], Jonas). The contracted area increases in length and the degree of spasm diminishes during a meal; when examinations are made at intervals of a few days it is found to vary in degree, and it may sometimes be completely absent. Spasmodic contraction does not prevent the rapid filling of the distal segment of the stomach even whilst a meal is being taken, and never leads to peristalsis in the proximal segment; this is an important point in diagnosis, as peristalsis is often visible above the obstruction produced by an organic hour-glass contraction.

Faulhaber [3], Barclay and Härtel have shown that a partial organic hour-glass constriction, due to an ulcer which is still active, may be rendered complete by the occurrence of spasm, so that stenosis,

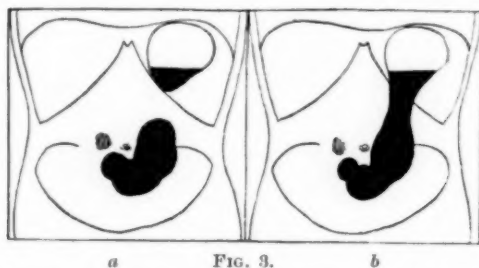


FIG. 3.
Spasmodic hour-glass stomach: a, spasm present; b, spasm disappeared after vigorous contraction of abdominal muscles.

thought to be severe from the X-ray examination, may be found to be comparatively slight at the operation.

(II) ORTHOSTATIC HOUR-GLASS STOMACH.

The most common condition which has led to mistakes in diagnosis is a result of the co-existence of severe atony with gastropptosis, as it is only present when the patient is in the erect position. I have called the condition "orthostatic hour-glass stomach."

When a stomach with normal muscular tone is examined with the X-rays in the vertical position, the upper limit of its contents is found to remain at a constant height whatever the quantity of food present. This is due to the tone of the muscular coat adapting itself to the volume of the contents in such a way that the intra-gastric pressure remains

constant. It is naturally not affected by the position of the stomach. Consequently in gastropotosis the stomach forms a tubular organ, the whole of which is filled with the mixture of food and gastric juice, except part of the fundus which contains gas; some narrowing is generally present in the centre of the body (fig. 4).

A dropped stomach, the tone of which is deficient, acts in a very different manner. Its walls do not contract upon the gastric contents, so that the food falls at once to the most dependent part of the organ

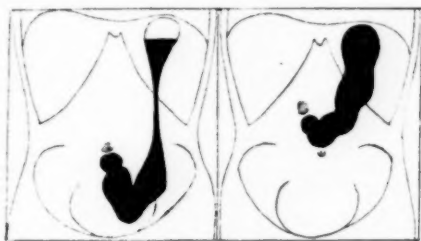


FIG. 4.
Gastropotosis.

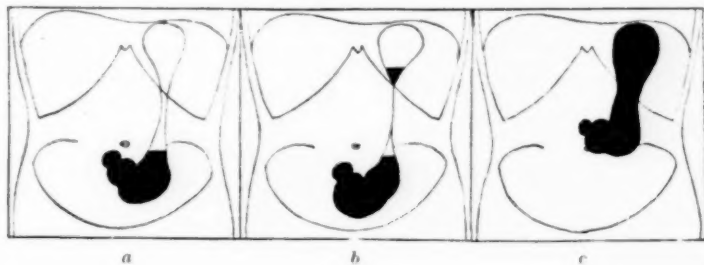


FIG. 5.
Orthostatic hour-glass stomach: *a*, vertical position, first stage; *b*, vertical position, second stage; *c*, horizontal position.

(fig. 5, *a*), which sags deeper and deeper as the quantity of food present increases. The upper limit of the gastric contents is therefore abnormally low, and only rises slowly as more food enters the stomach. The fundus being fixed, the food and gastric secretion in the most dependent part of the stomach exert a considerable tension upon its body, which becomes more and more stretched. The passage between the fundus and the dependent part of the stomach becomes narrower

and narrower, until finally its lumen is completely obliterated, the stomach being now divided into an upper segment and a lower and much larger segment containing the food and a small quantity of gas. If more food is now swallowed it remains in the upper part of the stomach (fig. 5, *b*), and small quantities can be seen periodically passing through the neck to join the main portion of the gastric contents. This hour-glass condition of course disappears immediately the patient lies down (fig. 5, *c*, and fig. 6). A mistake in diagnosis in such a case would never be made if all patients with suspected hour-glass stomach were examined lying down as well as standing up. There is, indeed, an unfortunate tendency at the present day to examine the stomach with the X-rays in the vertical position only. Many observers only examine the patient when the whole bismuth meal has been swallowed, or at the beginning of the meal and again at the end. In such circumstances the

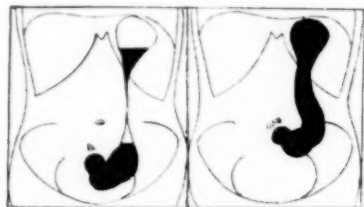


FIG. 6.

Orthostatic hour-glass stomach.

hour-glass condition seen in fig. 5, *b*, would be discovered, but the manner in which it develops would be missed. In order to avoid mistaking this functional hour-glass stomach for an organic condition, it is therefore necessary in doubtful cases to examine the patient at short intervals whilst the bismuth meal is being taken. In most cases the hour-glass condition disappears if the patient contracts his abdominal muscles or pressure is exerted on the lower part of the abdomen. Occasionally, however, the ptosis is so extreme that the lower segment of the stomach is further depressed instead of raised by this means (fig. 7).

I have already briefly referred to an important characteristic in the appearance of both spasmodic and orthostatic hour-glass stomachs, by means of which they can be distinguished from the organic condition. The upper portion of the stomach is conical in shape, and tapers below to a point from which the food can be seen to pass at intervals through the narrow neck into the lower portion of the stomach. When the

hour-glass constriction is organic, the upper division of the stomach is not conical, and part of it almost invariably sags below and to the left of the entrance to the constriction (fig. 8), as was first pointed out by Cerné and Delaforge [2].

An organic hour-glass constriction is often rendered more complete owing to the sagging of both segments which results from gravity when the erect position is assumed. This explains the relief obtained by lying down in such cases as that from which fig. 8 was traced.

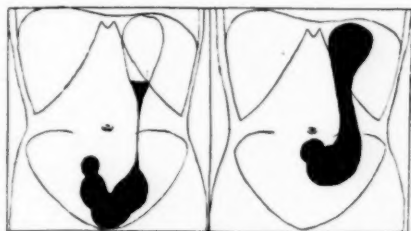


FIG. 7.

Orthostatic hour-glass stomach. Splashing was felt in the left iliac fossa five hours after breakfast of tea and toast.

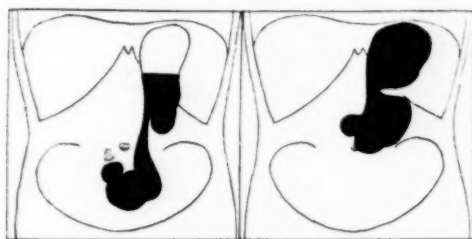


FIG. 8.

Hour-glass stomach due to healed ulcer of twenty-five years' standing. Complete relief after gastro-gastrostomy.

(III) FUNCTIONAL HOUR-GLASS STOMACH DUE TO ADHESIONS.

A third form of functional hour-glass stomach may result from the presence of an ulcer on the lesser curvature adherent to the left lobe of the liver. When the patient stands, the stomach tends to assume a vertical position. The ulcer being fixed to the liver, a line of tension is

produced diagonally across the stomach. The greater curvature is held up at the point where the line of tension meets it, and the part of the stomach immediately above tends to sag down, an appearance of hour-glass stomach being produced, although no constriction or only a slight one exists (fig. 9). This condition sometimes resembles organic hour-glass stomach even more closely than the functional forms already described, as part of the upper segment may sag below and to the left of the neck. But, as in the case of orthostatic hour-glass stomach, the constriction disappears on lying down.

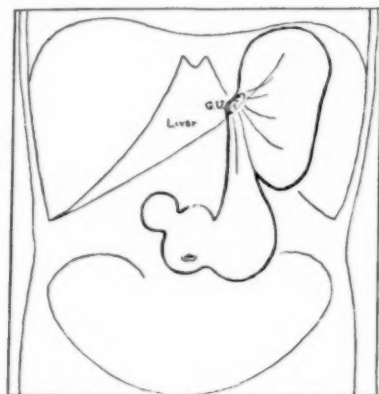


FIG. 9.

Functional hour-glass stomach, due to adhesions of a gastric ulcer (G.U.) to the liver.

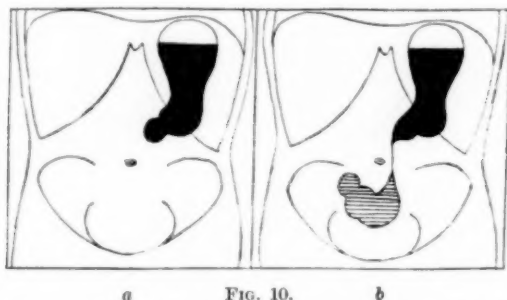
PSEUDO-HOUR-GLASS STOMACH.

The conditions so far described are examples of true hour-glass stomach, although the hour-glass constriction is not organic in nature. It may be well now to refer briefly to what may be called the pseudo-hour-glass stomach, which is not a true hour-glass stomach at all, but which has led to errors in diagnosis owing to misinterpretation of the shadows seen during an X-ray examination. In the early days of gastric radiography the examination was generally made with the patient in the prone position. As the bismuth was often given in a fluid suspension it rapidly fell into the most dependent parts of the stomach. Most of it therefore collected

in the fundus, whilst a smaller quantity often collected in the pyloric vestibule. Whenever the stomach was enlarged towards the right the quantity of bismuth in the pyloric vestibule was increased, and a comparatively large shadow was visible to the right of the middle line; this was more or less completely separated from the shadow of the fundus seen below the left dome of the diaphragm. This appearance led Gray [8] and other observers to the conclusion that the stomach is normally divided into two parts by a definite constriction near its centre, which Gray called the third sphincter, but subsequent investigations have proved conclusively that this view is incorrect. In the most marked cases it was believed that an hour-glass stomach must be present. In one of my earliest cases—in 1907—Dr. C. J. Morton and I came to this conclusion, although I had previously diagnosed duodenal ulcer on clinical grounds. I advised operation, and Mr. Rowlands discovered that a duodenal ulcer was present, but no hour-glass contraction. We believed at the time that the appearance was due to spasmodic contraction in the centre of the stomach, but recent experience has shown that it was simply due to the fact that the patient was given bismuth carbonate stirred up with milk instead of a "bismuth meal," and was examined in the horizontal instead of the vertical position. Such a mistake could hardly be made at the present day; but it shows how important it is that the bismuth should be mixed with some form of food such as porridge, which does allow its rapid sedimentation, and that the examination should be made in the vertical as well as in the horizontal position.

I have now described the various conditions which are likely to be mistaken for organic hour-glass stomach. I should like, in conclusion, to direct attention to the fact that cases of extreme organic hour-glass contraction not only give none of the physical signs, which are sometimes present in the slighter forms, but are very likely to be missed with the X-rays, unless the examination is carried out in a special way. When the bismuth meal has been taken the upper division of the stomach is clearly visible in the vertical position, but its lowermost point does not reach the level of the umbilicus, and in two of my cases did not extend below the left costal margin (fig. 10, *a*). When the history and symptoms of the patient point to pyloric obstruction and the stomach is found to be very small instead of large, a tight hour-glass stricture should at once be suspected. The stricture may be so tight that nothing passes through it during the initial examination,

and even an hour later nothing but the upper segment of the stomach may be visible. In such cases it is necessary to examine the patient a second time about six hours after the bismuth meal. By this time sufficient bismuth will have reached the lower segment of the stomach for it to be visible, and in some cases a fine line can be seen joining the two segments together (fig. 10, *b*). If pyloric obstruction co-exists with an hour-glass contraction, the



a FIG. 10. *b*

Hour-glass stomach, due to cicatrization of a gastric ulcer: *a*, half an hour after a bismuth meal; *b*, six hours after the meal.

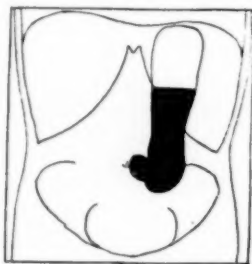


FIG. 11.

Same case as fig. 10, three weeks after gastro-gastrostomy.

lower segment of the stomach is clearly seen. More frequently the pylorus is unaffected; as the pyloric canal is then much wider than the passage between the two parts of the stomach and the food which slowly enters the distal part leaves it at once, very little bismuth accumulates in the latter. Consequently the shadow of the lower division of the stomach is always faint compared with that of the upper division, and it may be overlooked or mistaken for intestine, unless these facts are borne in mind.

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DISCUSSION

Dr. LANGDON-BROWN said he had been much interested in the conditions just described by Dr. Hertz. Last year he had an example of the form of stomach when the ulcer on the lesser curvature became adherent to the liver and it held up the stomach, dividing it into separate parts. But the case, of which he now showed pictures, was one which fell into the spasmodic group, which nearly everyone regarded as associated with gastric ulcer, but which appeared not to have been so associated, as far as could be judged without actually searching the inside of the stomach. The patient was a woman, aged 36, whom he saw two years ago, when she was suffering from some vomiting, sometimes immediately after taking food, sometimes an hour afterwards. On examination, the chief thing discovered was a tender swelling to the outer side of the appendix. Her mouth was in a rather septic condition. X-ray examination showed that the movements and the position of the stomach were natural, and the peristalsis was visible and exaggerated. As she improved so rapidly under ordinary medical treatment it was decided not to have the appendix explored at that time, but she was asked to come back if the symptoms returned. She did return at the beginning of the year, and repeated examinations showed she had definite hour-glass stomach. In order that there should be no mistake about it, Dr. Finzi examined on three separate occasions, and after she had taken different meals. The first meal was one of bismuth and rice, the second bismuth and milk, and he showed the picture of the form of constriction after the latter, which differed from that seen before. On each occasion the examination was made with the patient both in the upright and the recumbent postures, which was the custom at the hospital. Repeated examinations for blood in the stools were negative, and a test meal showed the chlorides were 0.3, the active hydrochloric acid 0.14, and the mineral chlorides 0.16. Mr. Daniel saw the patient with him and made a sigmoidoscopic examination, but there was very little definite to be found out. He adhered to his opinion that the lump in the neighbourhood of the appendix was probably responsible for most of the symptoms. Mr. Gordon Watson explored, and at the operation there was an interesting demonstration of the appearance of the hour-glass stomach. On

the stomach being exposed one saw a constriction in the middle, in the form shown in the picture he handed round. As she got more deeply under the anaesthetic that was seen to pass off. The region of the appendix was explored, and the appendix itself was found to be swollen and bent round upon itself, with its tip adherent again to the caecum; it formed a horse-shoe in shape. This was removed, and the patient made an uninterrupted recovery, leaving the hospital apparently quite well. She left the surgical ward before he was able to repeat the examination by X-rays, as he had hoped, to ascertain whether the condition finally passed off. But he hoped to be able to do that later, as she was still under observation. He admitted that he could not definitely assert that she had no gastric ulcer, but nothing could be felt of that kind, nor did examination of the gastric contents or stools reveal anything of the sort. It was evidently a spasmodic condition of the stomach wall, which could be seen to pass off when the patient was under deep anaesthesia. He regarded it as a reflex spasm in a typical case of appendix dyspepsia, and suggested that the gastric symptoms in these cases might be due to such spasm. Two or three years before these conditions were as well understood as now, he had a case of cirrhosis of the liver in which he was urged to have exploration done. X-rays showed a similar condition to this, and in that case he was able to assert positively that there was no ulcer. There was no hour-glass stomach to be seen in that case at the operation by the time the patient was under the anaesthetic. The patient later died of cirrhosis of the liver, and the stomach showed no trace of ulcer.

Sir JOHN BROADBENT asked whether Dr. Hertz considered that the bulk of the cases of atonic gastric dilatation, with big splashing stomachs, were orthostatic hour-glass stomachs. One saw many cases in which there was a splash over a wide area, especially in out-patient work, in which there was no opportunity for taking a series of X-ray pictures. He would also like to know what the author regarded as the special aetiological factors in producing the condition. Did these cases come on after some acute illness, or from improper feeding, or when the patients were run down generally, so that the stomach condition was a part of the general atony of the system? Also, what line of treatment would Dr. Hertz adopt for functional hour-glass stomachs? Gastro-enterostomy would not be recommended for atonic stomachs, as such cases did not do well after operation. Further, had Dr. Hertz ever met with jaundice in connexion with cases of hour-glass stomach due to ulcer? Such a possibility was suggested by the case described, in which an ulcer was adherent to the surface of the liver. He had himself seen one case in which there was an attack of jaundice from which the patient recovered. He went on fairly well for a time, but had another attack of pain and vomiting and melæna later. The patient would not consent to operation, but the case suggested gastric or duodenal ulcer with adhesions in the neighbourhood of the gall-bladder.

The PRESIDENT (Dr. Frederick Taylor) asked whether it had occurred to Dr. Hertz how to deal with the cases in his first group, those associated with

ulcer. Probably he would suggest that in those cases operation might be done and so remove the difficulties connected with the presence of the ulcer: he would be glad to hear whether success had been achieved by purely medical treatment. He recently saw a case the history of which was not yet complete, and therefore he had some hesitation in mentioning it. The case was that of a woman who was credited with having gastric ulcer more than twelve months ago, though the symptoms appeared to him from her history to be not entirely characteristic of the ordinary type of gastric ulcer. She was operated upon, in a provincial town, and no ulcer was found, but a gall-stone was removed from the gall-bladder. She was much relieved for two or three months, but subsequently the symptoms recurred in the same form, and she was sent to him (Dr. Taylor). He had some difficulty in arriving at a diagnosis, but an X-ray examination was made at Guy's Hospital, and an hour-glass stomach was seen. That was only a few days ago: and the cases recorded by Dr. Hertz naturally led him to consider whether it really was an organic constriction. The recurrence of symptoms and their persistence, together with the appearance of hour-glass stomach under X-ray examination, confirmed the history of ulcer a long time ago, although it might not have been discovered at the time of the operation.

Dr. HERTZ, in reply, said some of his cases of spasmodic hour-glass stomach had been due to ulcer, but not all of them. Härtel, writing from Bier's clinic, said that all his cases had been due to ulcer, but Dr. Barclay, of Manchester, said that in some cases no ulcer was present, and in a few of the cases that fact was proved by operation. He (Dr. Hertz) had no negative surgical evidence, but only negative clinical evidence, as in some of the cases in which a spasmodic hour-glass constriction was seen the symptoms were not those of gastric ulcer and therefore no operation was done. But he could not definitely say they were not due to ulcer.¹ He thought ulcer was the most common cause, yet there might be other causes, one of which he conceived might be appendicitis, as that might produce very definite gastric symptoms and might cause reflex spasm of the stomach, as in Dr. Langdon-Brown's case. In the case mentioned by the President, in which gall-stones had been found, he could imagine that the gall-stones might produce a spasmodic hour-glass stomach. It was possible to make a diagnosis by means of X-rays between the organic form and the functional form, although it was not possible to say what the cause of the functional form was. In answer to Sir John Broadbent as to the frequency and the aetiology of cases of orthostatic hour-glass stomach, he (Dr. Hertz) believed it was very common in people with atonic stomachs and feeble abdominal muscles. There were also curious cases in which the abdominal muscles were quite good, and the patient might even be athletic, and yet there was extreme

¹ Since this paper was read Sir Alfred Fripp has operated on a well-marked case of spasmodic hour-glass stomach, in which no ulcer could be found even after opening the stomach and thoroughly examining its interior; the appendix and gall-bladder were healthy.

ptosis of the stomach. He had shown a picture of a case in which the greater curvature of the stomach dropped into the true pelvis when the patient was in the erect position. That picture was from an otherwise healthy girl who lived an active life and took part in various sports. She had very good abdominal muscles, but she so strongly disapproved of becoming fat that she almost starved herself and became excessively thin. He believed her condition was due to an insufficiency of intra-abdominal fat. She improved considerably after rest in bed for two months and being forced to take more food. At the end of the two months the atony had gone and the stomach had risen a great deal, and though the orthostatic hour-glass condition could still be recognized, it was now less marked than before. With regard to the treatment of the two conditions, in the spasmodic type he advised against operation until medical treatment had been given a prolonged trial, because cases of gastric ulcer in the body of the stomach derived least benefit from the performance of gastro-enterostomy. Both in the cases in which there was ulcer and those in which there was not, there was no drug so good as belladonna. That was what one would expect, if, as was probable, the spasm had anything to do with the symptoms, because the spasm disappeared when atropine was injected. In regard to the treatment of the orthostatic form, rest in bed and feeding up were the two important points, because the hour-glass constriction disappeared as soon as the patient lay down, and there was a considerable difficulty in emptying the stomach of these patients so long as they were in the vertical position. When lying down, especially if the foot of the bed was somewhat elevated, the stomach emptied itself much more rapidly than when the patient was getting about. If the stomach emptied itself sufficiently rapidly for some weeks, and the patient had put on weight, he found that when the patient got up again the condition of orthostatic hour-glass stomach had disappeared, the atony had gone, and the ptosis was less marked. He had not seen jaundice in association with these cases.

The PRESIDENT: Is the pain in a special situation in the spasmodic form?

Sir LAUDER BRUNTON: Is there any association with dropped kidney in this condition?

Dr. HERTZ replied that he did not think there was anything special about the position of the pain in these cases, except that it was high up in the epigastrium. He believed the pain was produced in the upper segment of the stomach. With regard to there being any association of the condition with dropped kidney, in the majority of cases of the orthostatic variety, where the stomach was a good deal dropped, he had found the right kidney was dropped also. But the girl, to whom he had referred, had good abdominal muscles, and in the similar cases he had seen, the cause of the gastroptosis was a complete mystery to him, as it seemed that the stomach was the only organ which had dropped.

Medical Section.

April 23, 1912.

Dr. FREDERICK TAYLOR, President of the Section, in the Chair.

Nodular Leukæmia : with an Illustrative Case and References to over One Hundred others.

By GORDON R. WARD, M.B.

THE term "nodular leukæmia," is chosen to include all those cases of leukæmia in which nodules or tumours of leukæmic growth have been found in various parts of the body and have been obvious, to the sight or by inference, during life. It is used purely as a clinical term. Cases of this sort have been reported under a great variety of titles, such as mycosis fungoides, chloroma, Mikulicz's disease, Kaposi's disease, sarcomatosis, &c. These terms do not in the least suggest that there is any possible connexion between the cases described. It is not suggested that all the cases described under the above names are cases of nodular leukæmia, but merely that the latter may in its clinical manifestations approach the syndromes to which these various names have been applied. It may seem, at first sight, that it is not, in the present state of our knowledge, of much importance to the clinician, and of even less moment to the patient, whether his disease is called sarcomatosis or nodular leukæmia. In either case it is not very likely to prove amenable to treatment—for most of these are cases of the acute type and death follows the onset of the disease in a few months. As a matter of fact, there is one great point to be gained if the conception of nodular leukæmia should become more general, and this point is the avoidance of operations which are later proved to have been unjustifiable. Among the cases to which references are given at the end of this paper are to be found those of patients who have undergone such operations as the following—viz., excision of the upper jaw, complete mastoidectomy,

amputation of both breasts, laparotomy, and, of course, appendicectomy. A great number have also had skin nodules removed for microscopic examination, but this hardly comes under the head of unjustifiable operation. It was the knowledge that such operations had been performed, and the writer's good fortune in seeing two typical cases of nodular leukæmia within a few weeks, that prompted this paper.

THE USUAL CONCEPTION OF LEUKÆMIA, SARCOMATOSIS, &C.

It will be necessary before proceeding further to briefly mention the general conception of such diseases as those above mentioned.

Leukæmia is a morbid process characterized by excessive activity of the blood-forming organs reflected in the blood-stream by a varying degree of increase in the white cells. The acute cases are accompanied by profound constitutional disturbance throughout and often terminate in some septic invasion; the chronic cases may have very few symptoms until the later stages, when anæmia and resulting asthenia lead to death.

Chloroma is a disease of considerable rarity with a disproportionate amount of literature to its credit. In it tumours appear on the skull-bones which are found after death to be green in colour. Otherwise it resembles a case of acute leukæmia.

Sarcomatosis is a disease in which multiple tumours apparently of a sarcomatous nature are found, and which does not fit in with any recognized type of malignant disease and so has acquired a name for itself. Its symptoms are, of course, protean.

Mycosis fungoides is a disease characterized by a marked pre-fungoid stage in which pruritus is a prominent feature. This is followed by the development of tumours in the skin and later by the death of the patient from asthenia.

Mikulicz's disease is one characterized by symmetrical enlargement of the lachrymal glands and often of the salivary glands also. This also terminates after a variable period in the death of the patient from asthenia. Kaposi's disease is well summed up in the synonym "multiple hæmorrhagic sarcoma."

FALLACIES OF THESE CONCEPTIONS.

These conceptions seem clear enough and do not in the least suggest that the diseases in question have anything in common, but new facts have come to light, many of them of quite recent years, which provide many connecting links and necessitate a reconsideration of the position.

For instance, cases of mycosis fungoides were found in which the blood-picture was that of leukæmia, and cases diagnosed as leukæmia were found in which nodules developed indistinguishable from those of mycosis fungoides. Similar nodules were also reported in cases of chloroma. Then it was realized that the green colour which seemed to make chloroma such a unique disease might be present only in the minority of the skull tumours or even in the glands or marrow of cases of leukæmia which had no tumours. Moreover, the exact clinical picture of chloroma might, as in the case about to be recorded, be present without any sign of the distinguishing green colour. As the number of reported cases increased it was found that almost every shade of green might be present and it was pointed out that the same colour was commonly observed in pus—in the absence of the *Bacillus pyocyaneus*—and in at least one case it was observed in the leucocytes centrifuged from the blood in a case of chloroma. Then hæmorrhage into the skin growths in cases of leukæmia was realized to be by no means an uncommon occurrence, and Kaposi's multiple hæmorrhagic sarcoma came under suspicion, as did Mikulicz's disease when similar clinical features were found to be associated with cases of leukæmia.

These discoveries were disquieting to those who specialized in the formation of clinical types under the names of new diseases and also to those whose studies brought them into contact with these names. In other countries arose such names as "chloromyelosarcom," and the already myriad significances of pseudo-leukæmia were extended.

A consideration of as many of these anomalous cases as one could find records of seemed to warrant a more definite classification of them as clinical varieties of leukæmia, and the multiplicity of different inferences which would be drawn from any term already in use led to the adoption of the name "nodular leukæmia."

LEUKÆMIA—THE DISEASE.

The term "leukæmia" conveys to some people the conception of a perfectly definite disease or morbid process, to others it seems to denote a symptom which may perhaps be common to several such morbid processes. It is necessary to be clear on this point, for if it be held to be merely a symptom the conception of nodular leukæmia is quite valueless. Those who consider it a symptom usually approve the statement that the cells of a new growth may sometimes, as it were, dribble into the blood-stream to such an extent that they give rise to great

alterations in the leucocyte count—up to ten, twenty, or thirty times the normal. The writer has seen only one such case and came to the conclusion that the cells in question were undoubtedly precursors of the myelocytes—the reasons for this decision would be out of place here, for they were necessarily rather technical, and would occupy considerable space if given in full. One of the chief points was that they gave the oxydase reaction for myeloid tissue. There are no cases, so far as the writer has been able to discover, in which the cells of a spindle-celled or melanotic sarcoma have been found in the blood-stream, and this absence of evidence in the case of easily recognizable cells is very striking and supports the writer's belief that the cells of tissues other than those concerned in blood formation do not, as a matter of fact, gain access to the blood-stream. It is true that in various conditions cells may be found in the blood-stream that are not normally present. The blood-picture may even approach that of leukæmia in that there may be a certain proportion of myelocytes and unusual numbers of nucleated red cells. Such conditions are cancer with bone metastases and cholæmia or acholuric jaundice. But in these cases the number of cells never approaches that seen in a typical case of leukæmia, the proportion of abnormal cells is seldom high, and there is a demonstrable cause for their presence. Such considerations lead on to the question of the difference between leucocytosis and leukæmia.

LEUCOCYTOSIS AND LEUKÆMIA.

As some cases of nodular leukæmia have been reported as sarcoma and as sarcoma is not infrequently associated with a polymorphonuclear leucocytosis it is important to mention the essential difference between leucocytosis and leukæmia, meaning by the latter the important sign of the disease of the same name. It must at the outset be recognized that a differentiation based wholly on the number of white corpuscles will sometimes fall to the ground. The only statement that we can make is that a leucocytosis of over 100,000 cells per cubic millimetre is extremely rare, whereas that number is commonly doubled or trebled in leukæmia. The essential difference resides in the nature of the cells. The characteristic of the cells in leukæmia is that the majority of them differ from those normally found in the blood. The small lymphocyte of lymphæmia is very different from that of the lymphocytosis of whooping-cough. In leucocytosis, on the other hand, there is excess of cells which are like those normally found—the variation is in numbers and not in kind.

This, then, is a good working method of differentiating the two, but one must admit that it also falls short as an absolute criterion, for it is not uncommon in inflammatory leucocytosis to find a solitary myelocyte or even as many as 1 per cent. of these cells. This, however, may fairly be regarded as the exception which proves the rule and is not likely to prove an obstacle in practice.

There is one further point to which attention may be directed, and that is the presence in the blood-stream of white cells showing various stages of mitosis. So far as the writer's experience goes, this is never to be found in leucocytosis and is always present in leukæmia. This statement is made with all reserve, but it may be that we have here an absolute criterion; there are many points against the probability of its being so, but the question is worth investigation. The writer has found mitotic figures in a case of leukæmia, when the total cell count was as low as 6,000 per cubic millimetre.

The points, then, which, taken together, differentiate leucocytosis and leukæmia are three: the number of the cells, the nature of the cells, and the presence or absence of mitosis. No one of them alone—except, perhaps, the last—is absolute, but taken together they should prove ample for all practical purposes.

THE BLOOD IN LEUKÆMIA.

The condition of the blood in Leukæmia needs a little further consideration. The symptom leukæmia (with a small "l") is the one on which we chiefly rely for the diagnosis of the disease Leukæmia (with a big "L"). By an examination of the blood we expect to be able not only to recognize that we are dealing with a case of Leukæmia, but also to determine which variety of Leukæmia we are dealing with. Very rarely, but still quite often enough, we are disappointed in these expectations. In some stages of the disease Leukæmia, the symptom leukæmia is absent. In some cases it is present, but the variety is doubtful. To take the question of aleukæmic phases first, these may occur under the influence of treatment or as a result of the onset of sepsis or in the early stages of the disease when the blood-forming organs are affected, but the cells have not as yet overflowed into the circulation. The latter is, of course, a purely hypothetical explanation. We are not really in a position to explain this particular anomaly, but we must recognize that it occurs in very rare instances. It may in such cases be impossible to do more than suspect the nature of the disease. The case about to be

recounted was apparently one of this sort, but the writer had not the opportunity of examining the blood himself until a late stage.

That the blood-picture may not tell us for certain with which variety of Leukæmia we are dealing is not very surprising when we remember that the blood-picture is, in any given case, subject to wide variations. We do not know what the cause of Leukæmia is, and, therefore, for the purposes of this paper it may be called an unknown stimulus. This stimulus has an effect on the blood-forming tissues leading to apparently purposeless overgrowth. The first sign in the blood of this over-activity is the appearance of cells which are not mature, cells of a sort that are normally only found in the marrow or glands. These cells can, nevertheless, be assigned with reasonable certainty to either the lymphatic or myeloid series. Later on, if the disease pursues its course without complications, the type of cell becomes more primitive, and increasing difficulty is experienced in saying to which series it belongs. If the stimulus is very forcible the primitive type of cell may be present from the beginning, and in an acute case we usually expect to find a very primitive type of cell—i.e., a cell that is not far removed from the so-called indifferent lymphoid cell, from which both lymphocytes and myelocytes were originally derived. Much the same process may sometimes be seen in cases of cancer where, on the one hand, the appearance of the parent tissue may be exactly reproduced or, on the other, a rapidly growing epithelioma may be composed of a mass of indifferent cells with difficulty distinguishable from those of a sarcoma. The same appearance of more primitive cells may also be seen in the response of the erythrocyte-forming marrow to various degrees of hæmolysis. It is, therefore, easily understood that the blood of a case of Leukæmia may present a majority of cells which are, as far as our technique can determine, neither myelocytes nor lymphocytes, but some stage anterior to both. This it is that gives rise to difficulty in determining to what variety of Leukæmia a given case should be referred. It has also given rise to the report of various cases of so-called change of type in Leukæmia, any large round cell being assumed to be a lymphocyte and its occurrence in a late stage of a case of myelæmia being accepted as proof that what was originally myelæmia has become lymphæmia. Occasionally, if a case of Leukæmia with acute onset passes into a chronic stage, the opposite process may be observed—i.e., the slow diminution of the number of more primitive cells with an increased proportion of mature forms. No chronic type of lymphæmia, however, has ever been reported as changing into a chronic myelæmia nor vice versa.

We may say, then, of change of type in Leukæmia that there is never a change from one variety to the other, but that in either variety there may be an orderly progression from less to more primitive forms, and that the appearance of the latter usually means that one is dealing with an acute case or portends an early termination.

THE TWO VARIETIES OF LEUKÆMIA.

Before proceeding to the discussion of nodular Leukæmia, the writer's view as to the acceptance of two varieties of Leukæmia must be made plain. There are many people who hold that all leukæmia arises in the bone-marrow and that the glands are never alone affected. There seems little real evidence to support this view. It has already been pointed out that there is a mother-cell which seems to have the potentiality of developing into either a lymphocyte or a myelocyte. In the adult these cells are not discoverable in normal conditions, in the fœtus they are present in various parts of the body—e.g., marrow, lymphatic glands, spleen, liver, &c. In Leukæmia there is apt to be a reversion to the more primitive type, and according to the variety of leukæmia with which we are dealing, these mother-cells will develop into either lymphocytes or myelocytes. It thus happens that the marrow, by virtue of its content of mother-cells, may form lymphocytes, or the lymphatic glands, from the same mother-cells, form myelocytes. This apparent paradox explains some of those cases in which lymphæmia is said to have been present without any involvement of the lymphatic glands. Others are explainable by a reference of any large mononuclear cell not obviously a neutrophile myelocyte to the "large lymphocyte" class. It does not, therefore, appear to the writer that considerations of the tissues affected are entirely adequate grounds for classifying atypical cases of Leukæmia, for we know that obviously myeloid tissue may be found in the lymphatic glands in some cases and obviously lymphatic tissue in the marrow. In the same way both sorts of tissue have been found in the tumours of nodular Leukæmia. The writer is unable to accept the view that all varieties of Leukæmia originate in the marrow, which is the assertion on which the denial that there are any real varieties is based.

PATHOLOGICAL ANATOMY OF THE NODULES.

We can now pass to a consideration of the nodules themselves, and the first requirement is to place them, if possible, on an exact pathological basis. The most common sites for these nodules are the bones,

especially those of the skull, the skin and subcutaneous tissues, and the various sites in which lymphoid tissue is found in appreciable amount during health. There have been several explanations of their appearance, and these seem to contemplate the possibility that in different positions they may have different modes of origin. That identical growths in the same patient may have different origins is not easy to credit, and for this reason alone some of the explanations offered of the appearance of these nodules excite suspicion at the outset. Of such explanations the most frequent concerns the presence of nodules on the surface of the bones of the skull. It is asserted that these are due to the passage of cells from the marrow through the bone to the periosteum. One observer claimed to have demonstrated in sections the continuity of the marrow and the periosteal growths. As in Leukæmia, even the smallest vessels are commonly packed with cells, and as there are certainly vessels passing through the bone, we may surmise that it was some of these vessels that he succeeded in demonstrating [9]. But better evidence against this theory is the occurrence of nodules on bones which do not contain marrow—e.g., the thin bones of the orbit, the flat surfaces of the scapula, &c. In these situations some other theory must be employed to explain their appearance. The presence of nodules in the intestine allowed of the explanation that they were merely hypertrophies of pre-existing tissues—i.e., pre-existing lymphoid tissues. This is a very adequate explanation of these particular nodules, and it is not at all incompatible with the explanation already offered for those on the bones, but it takes one no nearer an explanation of those in the skin. Accordingly the suggestion was put forward that all these growths originated in hæmorrhages from the smaller vessels. This explanation would, of course, apply wherever the nodules were found. There are, however, certain points which make it very difficult to accept, the chief being that the growths do not resemble obvious hæmorrhages in similar tissues, having no blood-pigment in their substance such as one would expect if there had been an escape of red cells from the vessels, and such as is actually found in the obvious hæmorrhages. Moreover, the situation of the alleged hæmorrhages is peculiar, for, apart from those which have given rise to macroscopic nodules, there are other collections of cells which are visible under the microscope, and these are not distributed in the promiscuous fashion that one would expect if the hæmorrhage theory was the true explanation of the origin of these nodules. The microscopical collections of cells are best seen in the liver and are arranged as perivascular infiltrations—i.e., they form around

the vessels sheaths of tissue exactly similar to that observed in the glands, marrow and nodules. These sheaths are quite regular and very characteristic, and in the liver follow the distribution of Glisson's capsule and are as regular round the bile-ducts as round the vessels. This last factor is very much against their being hæmorrhages. Lastly it is not found during life that a hæmorrhage into the skin is followed by a nodule of growth, nor is a hæmorrhage in any other visible situation such as the conjunctiva, although growths may arise in such situations when there has been no apparent preceding hæmorrhage.

Putting aside, then, the hæmorrhage theory as untenable, we may pass to other theories directed to explaining these nodules in whatever situation they may appear. The most acceptable is that which supposes that they arise from pre-existing lymphoid foci and that such foci are, as a matter of fact, present in all parts of the body. In support of this theory we have the rapid origin of lymphoid tissue in various parts of the body in other conditions. About the edge of an advancing cancer, for instance, there is often a zone of round-cell infiltration which is absent in benign growths, and some suppose that this is of the nature of a defensive development of lymphoid tissue. It is paralleled by the appearance of lymphatic glands in large numbers in the lymphatic system near a malignant growth. These glands are certainly far more numerous than could be expected from the examination of the corresponding tissues in a healthy person. It is also asserted that in old persons in whom the lymphoid tissues have undergone a large degree of physiological involution the growth of a cancer will cause their re-appearance. There are many other diseases in which a round-celled infiltration is found, and in which the suggestion that these cells have wandered out of the vessels does not accord with the general opinion that lymphocytes are not amœboid, nor with the universal experience that these wandering lymphocytes never collect in sufficient numbers to form an abscess as is the case with the polymorphonuclears. Against this theory is the fact that we are not in a position to be dogmatic about the statements just made, since they do not rest on a scientific basis sufficiently demonstrated to be generally acceptable at present. These, of course, are not arguments against the possible truth of this explanation.

The writer's inclination to accept this theory in its broad outlines is strengthened by two further considerations, of which the first is that the favourite sites for these perivascular infiltrations and for the smaller nodules growing from them are the liver and the spleen—i.e., those

organs which are known to be concerned with foetal blood formation [107]. The second is that in Leukæmia the thymus is very often greatly enlarged, even when the disease has commenced in adult life, when the thymus should have been quite atrophic. The thymus in these cases often has the normal infantile shape, so that it cannot be explained by the supposition that the whole growth is due to some chance hæmorrhage into the remains of this organ. This resurrection of the thymus is even more notable in view of the fact that it also is an organ concerned with blood formation in the foetus, and to a less extent in early life.

The writer certainly feels disposed to accept the theory that there are scattered about all parts of the body, except in the epiblastic tissues—i.e., epidermis, epithelium and central nervous system—cells that may develop into lymphocytes and no doubt also into myelocytes, and that in Leukæmia of sufficient intensity these cells take on the function of forming blood-cells. In the commoner clinical variety only the adult blood-forming organs are affected; in a more advanced stage the organs which were concerned with blood formation in the foetus and early life resume activity; in a still more advanced stage any such cells, wherever placed, may become active. It would seem that such cells are particularly frequent wherever there is fibrous tissue—e.g., in Glisson's capsule in the liver, in the periosteum, in the subcutaneous tissue, in the breast, &c. On the other hand, the nodules growing from such cells have never been discovered in purely epiblastic tissues, although they commonly grow from the fibrous tissue subjacent to epithelium and epidermis and from the dura mater, &c.

With this provisional conception of how the nodules arise we can pass to a consideration of their clinical characteristics.

DISTRIBUTION AND CHARACTERS OF THE NODULES IN LEUKÆMIA.

I am inclined to think that the name "Infiltrating Leukæmia" would perhaps be preferable to that at the head of this paper, for the nodules are by no means always so circumscribed as the term "nodular" implies. They vary from a diffuse œdematous condition to an almost bony hardness. The œdematous variety has been chiefly reported as affecting the head and neck—thus the cases of Hallopeau and Lafitte [127] and of Dencker [131] were characterized by infiltration about the face, in the first of the nose and lips and in the other of the nose and forehead. In the case of Firth and Ledingham [92] there was a diffuse greenish infiltration of the scalp, and in the writer's case the same was present.

This is to be distinguished from the œdema which was present, for instance, in Hall's case [113] and which is common enough with tumours of any variety. The greenish colour of these infiltrations is not necessarily due to any pigment similar to that which has given rise to the name "chloroma" but is probably due in part to bruising and in part to the greenish hue which œdema of anæmic tissues seems so often to cause.

But apart from infiltrations there may also appear definite nodules of a fairly hard consistency—speaking for the moment of skin lesions only. These seem to have a considerable tendency to affect the face and body and are less frequent on the limbs. They vary a great deal in size and colour. In the case of Kreibich [19] there were pendulous masses on the face described as being as big as the closed fist; on the other hand, they have in a great many cases been no larger than a pin's head, although in these there were usually some that reached a greater size. Their position is never in the epidermis itself, but this may be eroded by the subjacent growth and in such a case there will be an ulcerating surface. An ulcer may also occur where there is pruritus [127], but the latter is an infrequent symptom and ulceration is the exception. Sometimes the nodules are more deeply placed and the skin may be movable over them, or both types may be present in the same case. They are, as a rule, multiple, but may be single [123] or in very small numbers. If the view above mentioned of the manner of their origin be accepted, it will at once be obvious how pleomorphic they must be, and the fact that they are so is further evidence in favour of that view.

The cutaneous lesions differ in colour as much as in form. The colour may be that of the surrounding skin, as will usually be the case when the nodules are deeply placed; it may be yellow or red or purple. All intermediate shades are met with and in addition there may be modifications due to hæmorrhages or to the development of the green colour of chloroma. Similar variations are met with in the skin nodules of Hodgkin's disease, but in both cases there seems to be a preponderance of cases in which a slate or grey colour is mentioned. The cases of Rolleston and Fox [18] and Leber [60] and Brunsgaard [140] are examples of this. The bibliography at the end of this paper does not make any pretence of being complete, but even a perusal of these cases would make it very plain that there is no possibility of setting up any type of skin lesion that could be regarded as characteristic. It is also to be remembered that these lesions may start as little more than maculæ, may be accompanied by a diffuse erythema and associated with

a great variety of other lesions such as vesicles and pustules—whether these latter are to be regarded as secondary in all cases is yet to be determined. Purpura, although a very common skin lesion, hardly falls within the scope of this paper. The best paper to consult as to associated lesions is, as far as the writer can discover, that of Hazen [90].

Coming next to those lesions which are more deeply placed, we find that two situations are mentioned with a strange frequency—viz., the eyelids and the breast. The former situation is noted in Cases 2, 60, 61 and 124, and the latter in Cases 7, 53, 71, 81 and 131. In Case 7 an operation was performed on the supposition that these lesions were sarcomata. It is interesting to note that the growths recurred *in situ*, showing, if there were any need to do so, that however these nodules may originate they soon acquire for themselves a power of expansion. As there is no tissue that is free from infiltration—i.e., no mesoblastic tissue—it is apparent that there is no limit to the variety of situations in which the deeper growths may arise.

We may next take the nodules of the submucous surfaces, and these are especially apt to develop where lymphoid tissue is abundant—i.e., in the alimentary tract. Minute nodules on the gums are so common in acute cases that they are important diagnostic points—so far as the writer's experience shows they are usually about the size of a mustard seed, but flatter than this simile might suggest. They are well simulated by the particles of food which are apt to remain in the mouth in these cases. It is therefore necessary to make sure that any suspicious nodule cannot be brushed away with a piece of lint or wool. There may also occur a general enlargement of the gums even to the extent of hiding the teeth—this is, however, seldom if ever pure lymphoid growth. In some cases the tonsils have been enormously enlarged and the same is true of the epiglottis; Bramwell [1] records two such cases. The lymphoid tissue at the back of the nose and at the back of the tongue is apt to be enlarged even before this is true of other structures. The mouth lesions in Leukæmia are well discussed by Rose Bradford and Batty Shaw [118]. The stomach may be the seat of very extensive growth, as in a case recently seen by the writer in which this organ was enlarged to three or four times its normal size and was wholly occupied by confluent nodules of various sizes. The condition was not suspected during life, as there were also symptoms of cerebral tumour and the clinical picture was dominated by the latter. Permission was not obtained to examine the skull, but there can be little doubt that the symptoms of cerebral

tumour were due to a lymphoid growth on the dura mater. In the case of Weinberger [68] there was extensive involvement of the stomach. In the case of Dock and Warthin [9] there was an increase of interstitial tissue due to the presence of minute foci of lymphoid tissue, and there was a nodule the size of a pigeon's egg in the fundus. It is disappointing to find later on in the very full account of this case that the nodule in question was a fibroma.

Nodules in the intestine and adjacent glands have been responsible for a great deal of trouble—thus in Case 24 there was considerable pyrexia, and a tumour in the abdomen of doubtful nature. The most favoured diagnosis was hepatic abscess, and laparotomy was accordingly performed. There was disclosed an enormous enlargement of the lymphatic glands. It is easy to be wise after the event, but it is also obviously to be regretted that Leukæmia was not suspected as a possibility. The following extract is from an account of another case by Warthin [25]:—

At the operation—appendicitis had been diagnosed—a large cavity nearly surrounding the bladder was opened, filled with many ounces of clear, inodorous, urine-tinted fluid. By extending the incision a large mass of small intestine and omentum was found, in which was imbedded the greatly swollen appendix, which was removed, but only a small amount of the entangled bowel could be separated. The blood examination on the day of operation showed a leucocytosis of 90,000. No differential count was made at this time.

That the symptoms of appendicitis should have been present in this case is not surprising, considering the condition found at operation, and the leucocytosis, although high, was not sufficiently so to be incompatible with the diagnosis made. The condition found post-mortem, namely, great enlargement of all the intestinal lymph-nodes—the mucosa of the stomach was four times as thick as normal—led to further examination of the blood films, which showed only 1·6 per cent. of polymorphonuclear cells, the rest being mononuclears of various sorts.

These two cases are sufficiently illustrative of the clinical difficulties which may arise when the nodules of nodular Leukæmia are best marked in the intestinal tract. There are many other cases in which similar changes have been found in less degree.

We can pass now to a consideration of the bone nodules. Here there is a distinct partiality for those of the skull, for whatever bones are affected those of the skull are least likely to escape. It is particularly these cases which have given rise to the clinical conception

of chloroma, but there are some cases [2, 7, 8, 9, 67, 69, 75] in which the skull tumours have been absent but the green colour present in other parts of the body, and others in which there have been skull tumours but no green colour [20, 63, and the writer's]. In the majority the skull nodules have been the first to attract attention, but in some such symptoms as sciatica have been first complained of and have been found after death to be due to nodules on the pelvic bones. The bones most frequently affected after those of the skull are the ribs—a sheath of lymphoid tissue round the long bones—e.g., the femur has also been noted in a few cases. These bone nodules may give rise to a great infinity of symptoms, and it is only necessary to mention the most frequent. Of these exophthalmos takes the first place, and it may be so extreme as to lead to complete destruction of the eye—in one case the eye was removed before the diagnosis was arrived at—i.e., before the exact nature of the growth was appreciated. It seems probable that in this case [23] removal would have been accomplished by Nature even if the surgeon had not intervened. The exophthalmos may be present without any growth in the orbit, but as a rule it means that the walls of the orbit are affected. Another common symptom is facial paralysis, which may be bilateral. Deafness and symptoms suggestive of cerebral tumour are not uncommon, but the size to which intracranial nodules may attain without these symptoms is often very striking. A visible sign of cranial nodules is often seen in a thickening of the tissues in the temporal region, which may give rise to the diagnosis of mumps in the early stages [113] and which sometimes produces a very marked appearance as if the face had been squashed between the temporal tumours. This appearance was very obvious in Essex Wynter's case [112] and is illustrated in his report of it. The bones of the face are not nearly so often affected as those of the cranium, but they only enjoy a partial immunity. The scalp is quite frequently affected—i.e., the underlying surface of the skull is the seat of tumours. These, as a rule, do not attain a great size, but may do so exceptionally. There is sometimes erosion of the bone by pressure of the growing marrow inside, but the nodules on the surface seem to lead to the opposite change and they are usually found to be associated with the outgrowth of bony spicules from the surfaces affected.

Among situations not yet mentioned specifically may be mentioned the vertebræ, where pressure on the spinal cord may produce paralysis, the lungs and pericardium, and the urethra.

There are certain features which these nodules have in common, no

matter where they may be situated. Of these the most important is what may be described as their instability. The skin nodules in particular are apt to vanish entirely for a time [15], and may be present only for a few days altogether [122]. The writer has seen two cases in which it was said that there had been skin nodules present, but in neither were any to be seen at the time of his examination. This feature is well known, of course, in mycosis fungoides. The tumours in the skull seem less evanescent, but in one case at least [113] they became very much smaller before death.

We are not in a position to say why these nodules disappear, but we are in possession of a certain amount of information bearing on the point. In the first place, it is well known that leukæmia uncomplicated by obvious nodules may show marked remissions apparently independent of treatment. In other cases these remissions seem to bear a very direct relation to treatment with arsenic and more particularly with X-rays. It is notable that the latter is of great value in other varieties of apparently causeless hypertrophy—e.g., cancer, goitre, &c.—with which leukæmia naturally falls into line. The other causative factor in remissions makes this analogy closer. It is the supervention of sepsis. As erysipelas will sometimes cure a rodent ulcer or Coley's fluid a cancer, so also does the onset of septicæmia not infrequently bring about an improvement in the symptoms of leukæmia. It is regrettable that this same sepsis is so often responsible for the immediate death of the patient, and it is probable that its effect on the leukæmic process has often led to difficulty in the interpretation of the post-mortem findings. I strongly suspect that the report on Case 16 would have been different if the septic factor had not been so markedly present. It remains then a fact that the sudden disappearance of these nodules is not unusual and is to some extent a diagnostic point.

Another feature which all these nodules have is a predisposition to hæmorrhages—in the case about to be reported there was hardly a nodule found which was free from them. This no doubt depends on a certain looseness of structure which is usual in them. It may be mentioned here that some of these nodules may be much harder than others and that this is due to the large amount of fibrous tissue that they contain in some situations. This fibrosis is no doubt comparable to that seen in the spleen in ordinary cases of myelæmia—i.e., it is mainly of a supporting nature.

Having now described briefly the clinical characters of the nodules, I should like to mention one or two points in diagnosis before reading the history of the case mentioned at the head of this paper.

Diagnosis may be extremely difficult—even impossible. The chief difficulty may arise from one of the three following facts: (1) There are stages in which the blood may not show any abnormality; (2) there may be nothing to suggest the possibility of Leukæmia; and (3) the symptoms of Leukæmia may be obscured by its complications—e.g., cyanosis from pressure of an enlarged thymus in quite an early stage, septic complications, &c.

If there is a way to avoid mistakes in diagnosis it may perhaps lie in some of the following procedures. In any case where a growth is suspected to be a sarcoma the blood should be examined if possible. This examination should include that of stained films. If a leucocytosis be found it should be carefully ascertained whether the cells present include any considerable proportion of cells not normally found in the blood-stream. In any case if such cells were found, even if there were no total increase, it should suggest the propriety of considerable caution before any operative procedures were carried out. Such an examination of the blood is not a highly technical process and could certainly be done in any hospital with a laboratory. This would be sufficient to prevent most mistakes.

Secondly, in any case of multiple tumours of any nature, especially if the patient is anæmic, the suggestion of leukæmia should be present. If once suspected, there would be very few occasions on which it could not be verified or excluded.

Thirdly, in the absence of characteristic or suspicious blood changes in cases of single or multiple sarcoma the following points should be noted whenever possible—viz.: (1) The condition of the glands and spleen; general enlargement of the former would be very suspicious, especially if associated with splenomegaly. (2) Signs of hypertrophy of lymphoid tissue in the mouth and, in particular, the presence of minute nodules on the gums should be looked for. (3) The condition known as leukæmic retinitis, in which the vessels of the retina are outlined by white streaks of perivascular infiltration should be looked for. (4) Enlargement of the kidneys, which is almost invariable, at least in acute cases, should be excluded and the urine examined for the presence of a suspicious number of mononuclear cells and signs of nephritis; and (5) whenever possible a portion of any suspicious growth should be excised and examined before proceeding to any radical operation.

The writer feels conscious that these precepts are not very satisfying and by no means suited to the exigencies of a busy general practice. This cannot, however, be accounted a reason for not mentioning them.

They may also seem somewhat out of proportion to the frequency with which nodular Leukæmia occurs. The writer has, however, seen cases of Leukæmia in which the earliest diagnoses were respectively hysteria, septic stomatitis, asthma, and rickets, while a glance at the appended bibliography will show that the diagnosis is not by any means always clear at the outset.

We can now pass to a consideration of a case which for want of a better term the writer has called one of nodular Leukæmia.

A CASE OF NODULAR LEUKÆMIA.

For many of the details of this case I am indebted to Colonel Scanlan, who saw the child before admission to hospital, and to Dr. Mitchell, of the Royal Surrey County Hospital, who kindly afforded me every facility for examining the patient. I am also indebted to the Resident Medical Officer, Dr. Kerr, for much information.

The patient was a child, aged nearly 2. About six weeks before admission she had suffered from whooping-cough, and had not entirely lost the characteristic cough at the time of her death. There was no other previous illness of note. About the same time she was noted to be getting pale and had signs of rickets. She was treated for some time by Colonel Scanlan as a case of rickets, a diagnosis later concurred in by Dr. R. C. Jewesbury. After a few weeks, symptoms developed which seemed to be incompatible with this diagnosis—viz., swelling of the glands of the neck, slight exophthalmos, and an increased degree of anæmia. Colonel Scanlan formed the opinion that the patient was suffering from chloroma, and she was admitted to the Royal Surrey County Hospital on November 6, 1911. A few days before admission she had a severe attack of epistaxis and bruising in various parts of the body.

The notes on admission were briefly as follows: The patient resents any attempt to move her and lies curled up in bed. There is apparently tenderness of the epiphyses, and those of the radius and ulna are thickened on both sides. There is beading of the ribs. The skin is waxen and the mucous membranes white. There is no obvious exophthalmos. The gums are swollen and bleeding freely. Tongue very furred. Heart and lungs normal. Abdomen protuberant, liver one finger's breadth below the costal margin, spleen not palpable, but this may be due to the fact that palpation seems to be productive of considerable pain, and so has not been persisted in. Enlarged glands in

both groins. Purpuric spots on legs. There is a blood-stained discharge from the nose and slight discharge from the ears.

Between this time and the occasion—about two months later—on which I saw the child, there seems to have been a succession of septic troubles, progressive enlargement of the glands in the neck, and increasing anæmia. A blood count made a month after admission and about the same time before death was as follows. It was made from specimens sent by Dr. M. Alex. E. Gow:—

Red blood corpuscles	...	1,950,000 per cubic millimetre	
Nucleated red blood corpuscles	...	235 per cubic millimetre	
White blood corpuscles	...	10,000 per cubic millimetre	
Polymorphonuclears	...	4,200 per cubic millimetre, or 42 per cent.	
Eosinophiles	...	130 per cubic millimetre, or 1·3 per cent.	
Small mononuclears	...	5,300 per cubic millimetre, or 53 per cent.	} 56·6 per cent.
Large mononuclears	...	360 per cubic millimetre, or 3·6 per cent.	
Poikilocytosis and polychromatophilia well marked.			

The percentage of mononuclears is high, but the total number not higher than one may reasonably expect at that age—moreover, the child was suffering from whooping-cough, a disease which may of itself give rise to a leucocytosis as high as 100,000 per cubic millimetre. In view of the later finding of lymphæmia this presence of whooping-cough is of interest as a possible ætiological factor, but probably the interest is more apparent than real. The right pre-auricular gland was the first to enlarge of those about the head; this has been noted in other cases. On more than one occasion the glands threatened to suppurate, but this—although recorded in some cases—did not actually occur. There were, of course, abundant septic foci which might have led to breaking down of the glands—viz., middle-ear disease, conjunctivitis, purulent rhinitis, and extensive oral lesions. The glands in the neck reached a very large size, and the skin over them was discoloured and appeared greenish. This is not to be wondered at, as most of them were the seat of hæmorrhages of varying extent. Other features were the presence of subconjunctival and other hæmorrhages and of a greenish infiltration of the scalp (see Case 92). The green colour of the latter was not noted post mortem, and some, at least, of the apparent infiltration was œdema over the skull nodules found in that situation. These never reached a great size and were not distinguishable during life. One of the most interesting features was the sudden appearance of several small skin nodules in the scalp. These were of the same colour as the surrounding skin and lasted only a few days. There was also a rash on the back. It is not certain of what nature this was, but a rash has preceded the appearance of nodules in several cases.

The writer did not see the case until three days before death. The notes then made were as follows:—

The patient looks extremely ill and lies in bed with the legs flexed, and objects to any attempt to move her, which seems to cause pain. The examination was considerably hindered by the pain, as there seemed no adequate reason for distressing the child in order to elucidate points that were so obviously likely to be apparent in a few days from a post-mortem examination. The colour of the face was yellowish-green, and this was even more marked over the glandular swellings in the neck. The scalp was not green but slightly œdematous. The gums were swollen and bleeding. On such parts as could be seen small lymphoid nodules were plainly visible. The nose was not clear, and there appeared to be a bloodless discharge from it. The eyes were hardly, if at all, prominent; the pupils were normal. It was not possible to get a view of the fundi. There was a small recent hæmorrhage at the outer canthus of the left eye and a larger sub-conjunctival one on the same side. The eyelids were swollen and nearly hid the right eye. From both conjunctival sacs there was a slight discharge. The ears appeared to be normal, but it was not possible to get a good view of the drums. The child was apparently not deaf.

On both sides of the neck were swellings obviously due to enlarged glands—these were largest on the right, the side on which they first appeared. The individual glands were discrete in places, but in others appeared to be matted together. There were two swellings which it seemed were possibly connected with the bone, but this was subsequently discovered not to be the case. The first was situated just below the ramus of the jaw on the right side, and the second was in the left parotid angle and caused some difficulty in opening the mouth. All these swellings were moderately hard, and the skin over one of them was somewhat red. In both axillæ were several small hard glands about the size of peas. It was not possible to palpate any glands in the groin. There were three purpuric spots on the back, but no others except those mentioned near the eye. The liver and kidneys defied palpation, but the apex of an enlarged spleen could be felt to strike the hand at about the level of the umbilicus.

There were crepitations and râles over the whole of the front of the chest; the back was not examined. The pulse-rate and temperature were both elevated. The urine was of a yellowish-green colour, and contained a deposit of phosphates. It did not contain albumin, and this had been noted only once since admission. The patient had gained

weight during the last week, a feature of Hall's case [113]. In his case this increase in weight coincided with a diminution in size of the tumours and of numbers in the lymphocytes.

POST-MORTEM EXAMINATION.

This was made three days after death. There was little or no post-mortem decomposition and no discoloration of the skin beyond that due to ante-mortem hæmorrhages.

The lungs showed extensive œdema and in parts patches of broncho-pneumonia. They were very pale. There was slight general enlargement of the bronchial and mediastinal glands, but the thymus was not identified, and was certainly not hypertrophied. The pericardium was normal. The left side of the heart was very markedly hypertrophied, and there was patchy fatty infiltration but no definite tabby-cat striation. There was a little stringy white clot in the heart.

The intestines were healthy to the naked eye except that in the colon there were minute dark-coloured specks which seemed to represent hæmorrhages into the smallest lymphoid follicles. All the mesenteric glands were enlarged to about the size of a cob-nut, and most of them were the seat of hæmorrhages. The liver was enlarged and reached at least 2 in. below the costal margin. It was pale and slightly fatty, and contained many well-marked light areas.

The spleen was considerably enlarged and dark red in colour. The cut surface presented a homogeneous appearance.

The kidneys were both enlarged and were alike in being the seat of extensive changes. They were mottled with white and red in spots and streaks of all sizes, and the surface was rendered irregular by hæmorrhages into their substance and by nodules of growth.

Only one of the adrenals was found, and this was white on section, and the differentiation between cortex and medulla was not seen.

Other than those already mentioned only the lymphatic glands of the neck showed marked changes. These were very much enlarged, were not green in colour, and were the seat of hæmorrhages. All the lumps about the head and neck noted during life were due to glandular swelling. The glands in the axillæ and iliac regions were small and harder than those in the neck. There was no excess of lymphoid tissue at the posterior aspect of the tongue, but there was a small mass of lymphoid tissue on either side of the epiglottis. These were of a dull olive-green colour, but this colour had disappeared the next day.

On removing the scalp there was revealed a very striking condition. The major portion of the frontal and parietal bones was covered by a number of flat sessile tumours which cut as if they were thickened periosteum and stripped off with the periosteum when it was removed. Most of them were the sites of hæmorrhages. These tumours were no doubt responsible for the apparent thickening of the scalp noted during life, when there was, however, no suspicion that there were definite nodules in this position.

The inner aspect of the same bones presented a similar appearance, and there were also nodules of growth in the middle and posterior fossæ. Besides the actual nodules, of which the majority were flat and sessile, there was a diffuse thickening of the dura mater, particularly marked about the torcular Herophili and the venous sinuses generally. This appeared to be of a more fibrous consistency than the nodules. When the dura was stripped off it took all the nodules with it, nor was it difficult to strip except at the sutures. The underlying bone was left covered with spicules divided from each other by fossæ of varying depth and size.

There was neither discoloration nor tumour of the brain itself. There was excess of the cerebrospinal fluid but no œdema of the meninges. The diploë showed a very thin layer of red bone-marrow. That of the sternum was of a similar colour and was only present in small nodules which seemed to represent centres of ossification. That of the femur was darker in colour. As it had been difficult to obtain permission for an autopsy, it was considered inadvisable to examine any other bones.

Slides were made from the following organs: glands, lymphoid tissue about epiglottis, skull nodules, liver, kidney, adrenal, heart, marrow, dura mater, and spleen. These slides were made by just touching the cut surface of the cut organs with a clean slide, care being taken not to exert any pressure in a direction likely to give rise to smearing. These "contact slides" allow of a much more useful examination than the usual "smears." In all cases there was seen an excess of cells of a type identical with those of the blood. In many cases there were masses of white cells showing that foci of lymphoid proliferation had been cut across.

Sections were also made of these tissues and will not be described in full, as they varied in no important particular from other published descriptions. They may be briefly summarized as follows:—

Glands: These showed the normal structure of a lymphatic gland in a state of extraordinary activity. The sinuses were packed with

cells and the various zones of the glands obliterated by the excessive proliferation of cells. They contained a minimum of fibrous tissue.

Lymphoid tissue from the epiglottis: This showed a similar appearance to that of the glands.

Spleen: This also showed an appearance roughly comparable to that of the glands, but there was more fibrous tissue and some proliferation of endothelial cells with signs of blood destruction in the presence of pigment granules and phagocytosis of red cells.

Liver: The perivascular infiltration was well marked and the white areas referred to were seen to be due to collections of white cells similar to those in the blood.

Kidney: This showed many changes. Cloudy swelling and infiltration with lymphocytes, here and there definite nodules. The glomeruli were not especially affected nor the areas around them, but on the whole the kidney was the seat of denser infiltration than any other part of the body.

Heart: This showed no lymphoid foci in the sections, but one such was apparent in a contact slide.

Marrow: No section made—contact films showed enormous numbers of cells identical with those in the blood.

Dura mater: The nodules were seen to be growing mostly from the superficial layers. No connexion traced with the deeper layers.

Skull nodules: Similar to those of the dura mater.

BLOOD EXAMINATION MADE ON JANUARY 5, 1912.

Red blood corpuscles	...	628,200 per cubic millimetre
Nucleated red blood corpuscles	...	Four only seen after prolonged search, of these one was a megaloblast, the rest normoblasts
Megalocytes, of 100 cells measured	...	15 per cent. (9 to 10 mm.)
Microcytes, of 100 cells measured	...	11 per cent. (4 to 6 mm.)
Average size, of 100 cells	...	7.49 mm.
Poikilocytosis frequent, but little polychromasia or stippling		
Hæmoglobin	...	15 per cent.
Colour index	...	1.209
White blood corpuscles	...	52,350 per cubic millimetre
Polymorphonuclears	...	676 per cubic millimetre, or 1.3 per cent.
Eosinophiles	...	52 per cubic millimetre, or 0.1 per cent.
Mast cells	...	52 per cubic millimetre, or 0.1 per cent.
Transitional leucocytes	...	624 per cubic millimetre, or 1.2 per cent.
Neutrophile myelocytes	...	52 per cubic millimetre, or 0.1 per cent.
Abnormal lymphocytes	...	50,894 per cubic millimetre, or 97.3 per cent.
Platelets	...	Almost nil
Coagulation time (Mercier)	...	63 seconds
Iodophilia	...	Absent
Fibrin formation	...	Good
Rouleaux formation	...	Normal
Spectrum	...	Oxyhæmoglobin

Among the "Abnormal lymphocytes" the majority were about the size of an ordinary lymphocyte. The nuclei took up most of the cell and

contained one to four nucleoli. The protoplasm was ragged and frayed in most cases. The larger cells were as much as twice the size of a lymphocyte and stained less deeply, the nucleoli being more pronounced and the protoplasm clearer. Beside these, every intermediate grade was seen and every variety of cell fragmentation and karyolysis of the nuclei. Mitosis was rare, only two quite unequivocal figures being seen, but there were a larger number of more dubious forms.

In fresh films of the blood one or two points were noted which are of interest. The fibrin formation was surprisingly good considering the hæmorrhagic tendency which the patient exhibited. The writer has noticed a similar anomaly in other cases of severe anæmia, and is inclined to attribute the hæmorrhagic tendency not to deficient clotting but to a deficient amount of red corpuscles. This means that the clot formed from any given volume of blood is not nearly so extensive or dense as a similar clot in a healthy person, in which case it is hardly to be wondered at that it does not satisfactorily close a bleeding vessel.

Rouleaux formation was as active as normal, but the resulting rouleaux suffered from the varying sizes of the corpuscles.

In a film ringed with vaseline and examined by dark ground illumination and in the ordinary way there was seen an enormous excess of those bodies which are grouped together as "blood dust," which is a conveniently expressive term, or hæmoconia—a scientific label which we owe to Müller. On closer examination these were seen to be abnormal not only in number but in size. There were the usual minute granules only visible with the dark ground illumination, but in addition there was a vast multitude of granules about the size of those of eosinophile cells. These were aggregated into chains and groups and had all the appearance of cocci. They did not, however, stain with methylene blue or Giemsa and were similarly refractive to Sudan III and osmic acid. They must have been present in the blood when it was drawn or very soon after, as they were quite plain in a slide fixed with iodine vapour for the determination of iodophilia. They did not in the least resemble platelets or the débris from their disintegration. The writer has observed such granules in another case of nodular leukæmia, but in this case they were within the cells and some of them seemed to stain slightly with osmic acid. I suspect that the granules in both cases were but little removed from those which cause the green colour of chloroma. That this colour is present in the blood has been obvious in some cases. They are probably the expression of some variety of degeneration, perhaps particularly apt to occur in primitive cells but also present in pus in some cases.

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DISCUSSION.

Dr. H. D. ROLLESTON said he was particularly interested in the paper because some time ago Dr. W. S. Fox and he had published a case in which the nodular infiltration of the skin was very well marked. He agreed with the author that "infiltrating leukæmia" was perhaps a better term than "nodular leukæmia." This manifestation of leukæmia might be divided into two groups: (a) The cases which came under the observation of the dermatologist, which perhaps were the most interesting; and (b) the tumour-like formations in the viscera which came under the notice of the pathologist. He believed that the cases with cutaneous manifestations were very rare. The leukæmic infiltration of the skin cells was often confused with the commoner condition of lymphadenoma of the skin. It was difficult to distinguish between a leukæmic nodule of the skin and lymphadenomatous nodules of the skin, as the histological structure of both was very much the same. The point he wished to raise was that pruritus was characteristic of lymphadenoma, and was rarely if ever met with in cases of leukæmia. Cases in which there was "nodular" leukæmia of the viscera, which were only seen at necropsy, were not so rare. In one case, that of a woman who had had chronic lymphatic leukæmia, there was an enormous thickening of the vermiform appendix entirely due to the massing of lymphocytes. There was also great enlargement of the glands at the back of the abdomen, which lay in a curious end-to-end fashion, so that they looked like a succession of blue slugs tracking down along the course of the ureters. In this case there was also very extensive lardaceous disease of the organs, for which there was no very obvious cause. On a few occasions he had seen considerable growth tracking along the vessels in the liver in connexion with the disease, and Dr. Miller had reported a case of myeloid leukæmia in which there were large tumours in the liver and in the spleen resembling, to the naked eye, sarcoma, into which very considerable hæmorrhage had taken place.

Dr. F. PARKES WEBER said that so many interesting points had been raised by Dr. Ward that it was difficult to select those on which to speak. With regard to the cases of leukæmia in which the cutaneous lesions were the first symptoms to attract attention, many years ago he saw an old man who seemed to be a typical example of the condition described by Kaposi as lymphoderma pernicioso. When that term was first introduced it was supposed that the condition differed from the "pre-mycotic" infiltrations of mycosis fungoides by being associated with leukæmia. That particular man's face might be called lion-like (somewhat resembling the face of nodular leprosy), as the skin was much thickened and thrown into folds by a diffuse small-cell infiltration. This cutaneous infiltration involved not only the face, but also a great portion of the rest of the man's body. He had the opportunity of seeing a section of the man's liver afterwards, and there was no

doubt that the liver showed characteristic leukæmic infiltration, especially, of course, of the interlobular areas. He believed, however, that the majority of cases of mycosis fungoides were not due to leukæmia. Dr. Ward also alluded to Kaposi's so-called "idiopathic multiple hæmorrhagic (or pigment) sarcoma." But in such cases there was no histo-pathological resemblance to leukæmic changes. He had had a typical case under his observation in which some of the little growths could be removed and microscopically examined. He had also studied the literature of the subject to some extent, and he found that almost every description gave the structure of these so-called idiopathic multiple hæmorrhagic sarcomata as absolutely distinct from leukæmic nodules. There were, on the other hand, very rare cases of leukæmia, such as the excellently described (1909) one of Dr. H. D. Rolleston and Dr. Wilfrid Fox, in which the occurrence of grey or bluish nodules in the skin first brought the patient under the author's notice and led to the detection of the leukæmia. An interesting point in those cases would be to know at what precise stage after the first appearance of the cutaneous nodules, one found the leukæmic changes distinct in the blood, or did obvious leukæmic changes in the blood always precede the formation of the cutaneous nodules? He did not know of exact observations on the subject. In regard to subcutaneous leukæmic nodules, he remembered once having been shown a subcutaneous nodule on the face near the lower eyelid in a little girl, aged 4, with lymphatic leukæmia.

In regard to pruritus, he had not met with it in leukæmia, nor did he remember a case in the literature of a leukæmic affection of the skin in which itching had been mentioned as a prominent sign. But in 1907 he had seen a case (a man, aged 35) of pruritus in Hodgkin's disease (lymphadenoma), in which the pruritus was a very striking sign. The man developed a red scaly rash almost all over the body; in fact, he became a "red man." He died of the Hodgkin's disease in 1908. One symptom which commonly occurred in connexion with the skin in acute leukæmia and led to the correct diagnosis being made was hæmorrhage. Such leukæmic purpura was, he believed, far more common in cases of acute leukæmia than chronic leukæmia. Death often followed within a few weeks from the onset of subcutaneous hæmorrhages. In a young man, aged 27, seen in 1911 by Dr. Weber, death occurred four weeks after the occurrence of spontaneous ecchymoses led to the diagnosis of acute leukæmia. In that case the patient was somewhat infantile and looked only 18 years old. Such hæmorrhages could easily convey the impression that a patient had been roughly handled or had been badly bruised. An acute hæmorrhagic septicæmic infection might also be wrongly thought of, especially when the tonsils became secondarily ulcerated (or necrotic) and a terminal general infection actually took place.

From the point of view of diagnosis he (Dr. Weber) wished also to allude to some local conditions in other parts than in the skin, which might direct early attention to the presence of leukæmia. Acute or "apoplecticiform" Ménière's symptoms might occur in people who were not previously known to have any blood disease, but in whom subsequent examination of the blood

showed the presence of leukæmia. He described a case in 1905, which was recorded in vol. lxxxviii, p. 185, of the *Medico-Chirurgical Transactions*, in which there was the acutest form of Ménière's disease, and the patient had chronic myelocytic leukæmia. In that case the diagnosis of leukæmia had been made before the onset of the Ménière's symptoms. Dr. F. W. Mott, at the same meeting (*ibid.*, p. 209), described the case of another man with myelocytic leukæmia and auditory symptoms. In a few cases of leukæmia the first important symptom had been prolonged priapism. In 1909 he was asked to see a man, aged 33, who had very severe myelocytic leukæmia, and who died not very long afterwards; in that case the diagnosis of leukæmia had been made a year previously, when the patient had an attack of priapism which lasted eighteen days, until the penis was incised.¹ In the *Edinburgh Medical Journal* for September, 1898 (p. 267), Dr. Weber had described the case of a man, aged 46, with priapism lasting over four weeks, but unfortunately he did not have the blood examined because he was then unaware of any connexion between prolonged priapism and leukæmia, and he lost sight of the patient. Sir Dyce Duckworth had published a case in which there was long-continued priapism attributed to a gouty condition, but in that case also the blood was not examined.²

There was an interesting group of cases in which both kidneys were symmetrically enlarged by diffuse infiltration with lymphocyte-like cells, which separated the renal tubules, apparently without destroying them. A case of the kind, in a girl, aged 5, was described by Dr. Weber in the *Transactions of the Pathological Society of London* in 1896.³ The kidneys were affected in that way, but the cæcum and vermiform appendix were also similarly affected, the walls of the affected gut being immensely thickened by infiltration with lymphocyte-like cells. As far as he knew such cases were generally not associated with an obviously leukæmic change in the blood, but they were so occasionally, as apparently they were in some of the cases described in a paper on "Fatal Lymphocythæmia in Early Life," by Dr. J. G. Forbes and Dr. F. S. Langmead.⁴ He asked whether Dr. Ward would regard such kidneys, when no leukæmic change in the blood had been discovered, as due to localized conditions preceding the development of obvious blood changes, or as examples of a kind of primary lymphocytosis or lymphosarcomatosis of the kidneys (or other structures affected).⁵ Connected with this subject arose the question of

¹ The elaborate paper of Carl Goebel (*Mitteil. a. d. Grenzgeb. d. Med. u. Chir.*, Jena, 1904, xiii, p. 578) shows that in 1908 incision of the penis was no longer a new method of treating leukæmic priapism. Goebel refers also to several cases in which prolonged priapism was an early symptom of leukæmia, and, since Goebel's paper, several other cases of leukæmic priapism have been described in the foreign medical literature.

² *Trans. Clin. Soc. Lond.*, 1892, xxv, p. 97.

³ *Trans. Path. Soc. Lond.*, 1896, xlvii, p. 117.

⁴ *Proc. Roy. Soc. Med.*, 1908, i (Clin. Sect.), p. 129.

⁵ On this question see F. P. Weber in the discussion on a paper by Dr. Guthrie and Dr. Emery, *Trans. Med. Soc. Lond.*, 1909, xxxii, p. 100.

whether it was possible that there might be some lymphosarcoma-like growths which produced a leukæmic change in the blood by scattering their lymphocyte-like cells into the blood-stream. C. Sternberg had grouped together certain cases as "leukosarcomatosis" or "chlorosarcomatosis." Possibly he might include such cases as the remarkable one excellently described by Dr. A. C. D. Firth and Dr. J. C. G. Ledingham¹ under the heading "Atypical Chloroma." In that case (at the post-mortem examination of which Dr. Weber was present) the osteophytic spicules of the cranium and long bones formed a remarkable feature.

He asked what kind of rash was the one which occurred in the case described by Dr. Ward. He had himself seen a very striking cutaneous rash in a boy, aged 10, with fatal subacute lymphatic leukæmia; the rash was a wandering gyrate (or circinate) marginate erythema, and reminded one of the tongue rash in a so-called "geographical tongue." In that case there was a history of a preceding pyogenic infection.

Dr. LANGMEAD regarded "nodular" leukæmia as a condition of considerable rarity. In a paper which Dr. Forbes and he had read on acute leukæmia, they were able to describe twelve cases of acute leukæmia in small children, but there was no example of the nodular form among them. Since then he had seen a case of what might be called "nodular" leukæmia, in which the nodules were most marked in the mouth and occurred also on the tongue. There was one pendulous tumour on the tongue of the size of a mulberry, and two or three others slightly smaller were to be seen on the inside of the cheeks. The blood examination showed it to be a characteristic case of leukæmia. He regarded tumours of that size as a very rare association of the disease. Another point was as to the probably greater frequency of acute leukæmia than had been generally imagined. Nine of the twelve cases which Dr. Forbes and he had described occurred within three or four years at one Children's Hospital—the Hospital for Sick Children, Great Ormond Street—and since then (1908) he had seen several others. He felt that if the condition were more generally known its occurrence would be found to be much more common than was imagined. With reference to the enormous enlargement of the kidneys in some cases as mentioned by Dr. Parkes Weber, amongst those described were some in which the kidneys were very greatly enlarged, and they all showed definite leukæmic changes in the blood.

Mr. T. P. BEDDOES desired to offer his meed of appreciation of Dr. Ward's paper. But his impression had been that the word "nodular" was not quite definite; he did not mean that it was not applicable in the present connexion. But, in the light of the references, the term "nodular" might fail to give the right impression to the reader of indices and abstracts when searching for original contributions and so lessen the value of the paper. It was not stated how far the words used to describe the condition corresponded with those

¹ *Proc. Roy. Soc. Med.*, 1911, iv (Path. Sect.), p. 63.

employed abroad, and so the reader would be left in doubt. He agreed with the opinion of Dr. Parkes Weber that mycosis fungoides was an absolutely distinct condition from that which the author was describing; and to imagine that the two conditions could be confused might lead to some carelessness in diagnosis. The same remark applied to the distinction from sarcomatosis and Kaposi's disease, which was a distinct condition.

The PRESIDENT (Dr. Frederick Taylor) asked whether it was held that a cutaneous rash was a lesion which justified classifying a case of leukæmia as one of nodular leukæmia. Further, he was not clear whether Dr. Ward would give the name "nodular leukæmia" to every case in which there were leukæmic infiltrations in any part of the body whatever. For instance, there were cases of mixed leukæmia, with enlargement of the liver, spleen, and lymphatic glands, in which growths of lymphoid type might be found under the pleural membrane; and in other similar situations Dr. Taylor suggested the possibility of the red rash with pruritus mentioned by Dr. Rolleston being of the nature of uræmic dermatitis.

Dr. GORDON WARD, in reply to the President, said his intention in using the term nodular leukæmia was to denote only a clinical condition—i.e., only cases which would be obvious clinically—it did not correspond with any one pathological entity. He would only be prepared to include, for clinical purposes, those cases which were obvious during life; but even if they were revealed during laparotomy, he would include them. With regard to cases in which a rash preceded the appearance of nodules, he considered that more knowledge was needed before any line could be laid down; indeed, he doubted if there was any definite line. But there was a clinical type of leukæmia with nodules, and it was to that that he had desired to direct attention. He was grateful to Dr. H. D. Rolleston for his remarks, and the case he spoke of was a very interesting one. The feature concerning the distribution of the lesions alone was of considerable interest; they were symmetrically arranged, and ran in circular lines on the lower part of the abdomen. He did not regard the skin lesions as very rare; he believed he had included in his paper at least fifty references to skin cases. In a short experience he had himself seen two cases in which there were skin lesions. With regard to the confusion with lymphadenoma, in his references he tried to keep out all cases of lymphadenoma, and all cases which were doubtful. Eminent authorities could not distinguish between the two under the microscope, and he therefore would not like to define the distinction himself. There were two or three references to cases of pruritus in association with undoubted leukæmia, but he had not necessarily verified those, as they occurred in the foreign references. With regard to the case of the man whose face looked somewhat like that of a lion, he had not seen recorded thickening and infiltration nearly all over the body to the extent which Dr. Parkes Weber mentioned; but cases were well known in which the face was involved, giving the leonine appearance. Dr. Parkes Weber seemed very emphatic in stating that mycosis fungoides had no

connexion with leukæmia. But Hazen and another investigated mycosis fungoides cases, and found that 50 per cent. of them showed lymphocytosis, which was remarkable. In some of the cases which they mentioned, the lymphocytes were over 100,000, and there was obviously leukæmia. Kaposi's disease, multiple hæmorrhagic sarcoma, had been confused with the present disease, but was quite a different disease; he had made a reference to such a case in the paper. Changes in the blood preceding the formation of nodules had been recorded, as well as nodules before any blood change. Pruritus had been recorded once or twice. This was, of course, more common in lymphadenomena. With regard to other signs of leukæmia, such as Ménière's symptom and long-continued priapism, if one found sarcomata and priapism long continued, it would certainly assist one in deciding not to operate. The occurrence of Ménière's symptom was very interesting, and was probably due to the presence of minute nodules in the ear, in most cases with hæmorrhage. The cases of enormously enlarged kidneys without leukæmia, composed of sarcomatous tissue, might be called lymphocytoma. Cases in which the breast tissue had been replaced by such tissue were recorded in the paper. He had not met with a lymphocytoma which did not arise from hæmopoietic tissue. In a large number of cases the marrow had not been examined, otherwise one would be on more certain ground. Nodules on the tongue were not recorded in the paper, and no doubt they were rare. In acute cases he had always found nodules on the gums, and probably no one who looked for them would fail to find them in such cases; he regarded them as of considerable diagnostic importance. The term "nodular" was more or less striking in connexion with leukæmia, and by it he directed attention to a clinical condition which was often misinterpreted. He apologized for having invented a term, but no other word which would cover the syndrome which he had mentioned had been brought forward to take its place. He did not know the exact name of the Kaposi's disease mentioned by Dr. Parkes Weber, unless it were sarcoid of the skin, so named by Boeck; it was more likely to be confused with nodular leukæmia than was hæmorrhagic sarcoma. The paper contained references to cases in which there had been that confusion.

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Neurological Section.

October 26, 1911.

Dr. F. W. MOTT, F.R.S., President of [the Section, in the Chair.

PRESIDENTIAL ADDRESS.

The Inborn Factors of Nervous and Mental Disease.

INTRODUCTION.

THE inborn factors of nervous and mental diseases having for some time past occupied my attention in my capacity as Pathologist to the London County Asylums, I feel I could not do better than make this the subject of my address to you to-night. Every neurologist recognizes the importance of the inborn factor in the production of neuroses and psychoses, and in certain degenerative conditions of the nervous system, which Gowers has designated under the collective term of abiotrophies. Before, however, I consider the subject of transmission of nervous and mental diseases permit me to direct your attention very briefly to the current theories of heredity.

Heredity is essentially a mechanism for preserving that which has been won by progressive evolution and natural selection, and every species has probably reached an unchangeable type in which the inheritance has become more or less perfected and fixed: there is in consequence continuity of the germ-plasm. If we argue that arrival of the fittest preceded survival of the fittest, then it may be asked what occasioned this arrival—to term it a sport or fortuitous variation is begging the question, for an effect always owns a cause, although we may not be able to discover it.

By the laws of heredity the germ-plasm has acquired a fixity in stability of characters of the species; the race, the sex, and to a much

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less degree of ancestral stocks, thus preventing the organs and structures of the body from varying in any considerable degree from the normal average, which has been attained by evolution. In fact, the only organ now in which the transmission of a functional hypertrophy could be useful is perhaps the human brain, and it is extremely doubtful, according to Kohlbrugge and other anthropologists, whether this ever takes place.

Functional hypertrophies of body tissues are useful in establishing an equilibrium according to physiological requirements of the environment; they are limited in their development, and are not transmitted in the Lamarckian sense; if they were, the stability of the germ-plasm in respect to the bio-chemical and dynamic equilibrium existing between all the organs and tissues of the body would be upset, and the product of evolution of countless ages endangered.

A functional hypertrophy in successive generations does not imply transmission of an acquired character, as observation and experiment show that it is the result of the persistence of the environmental conditions which led to the physiological adaptation.

THE THEORIES OF HEREDITY.

The "Law of Ancestral Inheritance" of Galton marks as great a step of progress in our knowledge of heredity as that which we owe to another great investigator, Gregor Mendel, who was born in the same year, 1822. Galton's law supposes that every ancestor of a particular individual contributes its quota to the heritable qualities of the individual. The law also states that the average amount of resemblance between an individual and any particular ancestor is capable of definite numerical expression. Thus the mean amount of correlation between (1) the two parents and the offspring, (2) the four grandparents and the offspring, and (3) the great grandparents and the offspring, and so on backwards in the ancestral lineage, diminishes in a geometrical series one-half, one-quarter, one-eighth, which is the same for all organisms and their characters.

Pearson represents a more rapidly diminishing series: (1) for the two parents, 0.6244; for the grandparents, 0.1988; for the great grandparents, 0.0630, &c. There is thus a mosaic of ancestral qualities. It is probable that the above represents correctly the average total contributions of ancestors when applied to the race as a whole, but it cannot be applied to individuals; for according to Mendel's theory of

inheritance certain ancestors may contribute nothing to the constitution of certain offspring in respect to certain characters. Galton himself admits this in his work on Natural Inheritance thus; he says: "Though one half of every child may be said to be derived from either parent, yet he may receive a heritage from a distant progenitor that neither of his parents possessed as personal characteristics." Again: "All living beings are individuals in one respect, composite in another. We seem to inherit bit by bit this element from one progenitor, that from another; in the process of transmission by inheritance elements derived from the same ancestor are apt to appear in large groups, just as if they had clung together in the pre-embryonic stage,

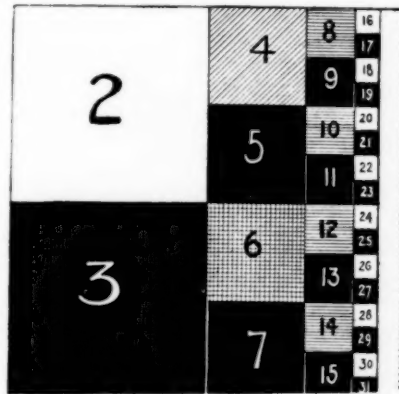
FIG. 1.¹

Diagram illustrating Galton's "Law of Ancestral Inheritance." (After Galton.) The figure was originally due to Mr. A. J. Meston. (*The Horseman*, Chicago, December 28, 1897.)

as perhaps they did. They form what is well expressed by the word 'traits,' traits of feature and character, that is to say, continuous features and not isolated points."

I will ask you to remember these conclusions of Galton, for they have a most important bearing upon the subject I shall discuss more fully later. Likewise let me call your attention to Galton's remarkable work on twins; he showed by a collective investigation the great

¹ This figure and that of fig. 3 have been taken from Professor Arthur Thomson's "Heredity," with the kind permission of the author and Mr. John Murray, the publisher.

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importance of the inborn factors in respect to character; for he found that twins with similar inborn characters remained similar when in later life they lived under different environmental conditions; likewise twins with dissimilar inborn characters remained dissimilar when brought up under similar environmental conditions.

Galton also made a statistical inquiry on good and bad tempers in English families, and as a result of this inquiry he says: "It now becomes clear enough and may be taken for granted that the tempers of progenitors do not readily blend in the offspring, but that some of the children take mainly after one of them, some after another, but with a few threads, as it were, of various ancestral tempers woven in, which occasionally manifest themselves. If no other influences intervened the tempers in the children of the same family would on this account be almost as varied as those of their ancestors." To recapitulate briefly, one set of influences tends to mix good and bad tempers in a family at haphazard; another tends to assimilate them, so that they shall all be good or all be bad; a third set tends to divide each family into contracted portions.

These facts ascertained by Galton are of great interest in connexion with the inheritance of the predisposition to neuroses and psychoses. Galton's law of regression again serves to explain many facts regarding the inheritance of feeble-mindedness as well as ability. In respect to the latter, Galton showed that only a few out of many children would be likely to differ from mediocrity, as their mid-parent, and still fewer would differ as widely as the more exceptional of the two parents. The more bountifully the parent is gifted by Nature the more rare will be his good fortune if he begets a son as richly endowed as himself, and still more so if he begets a son who is endowed yet more largely. But the law is even-handed, it levies an equal succession tax on the succession of badness as of goodness. If it discourages the extravagant hopes of a gifted parent, that his children will inherit all his powers, it no less discountenances extravagant fears that they will inherit all his weaknesses and tendencies to disease.

This tendency to revert to the normal average of the race is thus a great factor in heredity. Amphimixis, or the blending of the inheritance of two individuals, is claimed by Weismann as the great factor in the production of variation and evolution, but when there is a dynamic equilibrium of the germ-plasm established for a species amphimixis would act in the opposite way in arresting the perpetuation of a variation.

MENDELISM.

The Mendelian doctrine of the gametic segregation of alternate unit characters has recently been the subject of considerable discussion in relation to its application to the transmission of inherited disease; it is necessary therefore for me to briefly refer to Mendel's work on hybridization.

Mendel crossed tall peas with short peas, smooth with wrinkled seeds, yellow-coated with green-coated seeds. It will suffice if I refer to the first experiment of crossing tall with dwarf peas, cited by Bateson¹ in the discussion on heredity held by the Royal Society of Medicine a few years ago. To prevent self-fertilization Mendel cut off the stamens of one variety, then artificially fertilized with the pollen collected from the other. When the seeds of this plant which had been artificially fertilized

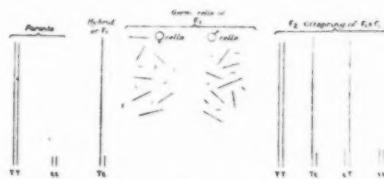


FIG. 2.

A diagrammatic representation of the germ-cells of the tall and short plants, and of their combinations.

with the other were sown, he had a propagation of three tall plants to one short. These plants were allowed to self-fertilize, and the seeds when sown gave the following results: the dwarf produced only dwarf, and one of the three tall plants produced only tall plants, whereas two of the tall plants, self-fertilized, produced proportionally three tall plants to one dwarf. Now Mendel explained it in this way. In F^1 , where a tall-bearing gamete is crossed with a short-bearing gamete, the chances are that tall will meet with short twice as often as short will meet with short or tall with tall, and this is what does happen, for in F^2 after self-fertilization there are three tall plants to one short, but two of these tall plants are hybrids, and have characters of tallness and shortness in each gamete. This is shown by the fact that if these hybrids of F^2 generation are self-fertilized again, we shall have in F^3 the same result as in F^1 , viz., three tall and one short (fig. 2).

¹ "Influence of Heredity on Disease" [from *Proc. Roy. Soc. Med.*, 1909, ii], 1909, pp. 22-24.

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Tallness is the dominant character, shortness is the recessive, but the results of the experiments show that there is no blending of these alternate unit characters. The character which is prepotent in the hybrid offspring is termed dominant, the alternate latent character is recessive; for this case tallness is dominant, shortness recessive. If one of the extracted normals, whether tall or short, be taken, and the seeds sown, only tall or short plants can be obtained, and no amount of selection of the seeds of the shortest of the tall plants or the tallest of the short will convert a short into a tall, or a tall into a short.

Instead of taking tall and short characters in the crossing, we might take pigment and absence of pigment: we could then illustrate Mendelism with draughts, as this photograph shows (fig. 3). Professor

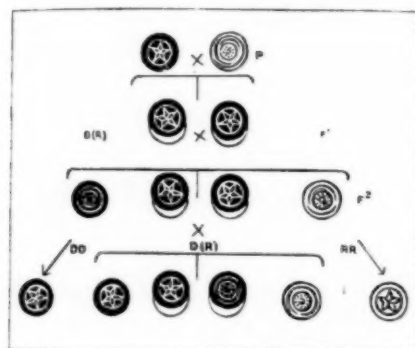


FIG. 3.

Diagram, photographed from draughtsmen, to illustrate Mendel's Law. (After Thomson.) First line (P), a black dominant and a white recessive. Second line (F¹), the hybrid offspring, D(R), the black patent, the white latent below. Third line (F²), one "pure" black, two "impure" blacks, and one "pure" white, 1DD+2D(R)+1RR. Fourth line, pure extracted dominant to the extreme left, pure extracted recessive to the extreme right; in the middle, as usual, 1DD+2D(R)+1RR.

Bateson said at this discussion: "I shall have no difficulty in showing you that the conclusions to which Mendel came are applicable in many cases to the descent of disease or congenital deformity." Pearson admitted the great importance of Mendel's work, but it was limited to the observation of gametic segregation; he was sure that it was too early in the day to assert that all the Mendelian doctrine holds for man, and he would even go a step further in questioning whether it holds for plants and animals.

Nettleship, on the other hand, takes up a much broader view of the application of Mendelism to human inheritance. He points out that the Mendelian theory refers to well-defined characters taken singly and separately. "Such are in peas, for example, tallness or shortness of stems, greenness or yellowness of seeds, smoothness or wrinkling of seed-coats. But complexities are introduced when two characters are permanently associated or inseparably linked or coupled in descent and in other ways. Even in such cases, however, careful analysis appears often to *succeed* in bringing the numerical results of breeding experiments that appeared hopelessly confused into line with Mendelian requirements. It is likely enough that some such associations and interactions between pathological factors may explain certain of the irregular proportions of diseased to normal in pedigrees of human disease."

THE TRANSMISSION OF DISEASE.

Nervous and other diseases are not all transmitted in the same way; there are some which are transmitted in successive generations by both sexes, sometimes equally, sometimes unequally. The majority of human heritable diseases, or tendencies to disease, are transmitted in this manner. Many pedigrees have been recorded which show that some well-defined abnormal condition or defect may descend uninterruptedly through five or six generations, and even a few pedigrees illustrating this mode of transmission for seven or eight generations have been recorded. Among the diseases belonging to this group may be mentioned Huntington's chorea, of which I will show you a pedigree of four generations; and through the courtesy of Dr. Bond, of Long Grove Asylum, I have had the opportunity of obtaining the central nervous system of the youngest member of this diseased stock (fig. 4). Other hereditary conditions which may be mentioned as belonging to this group are occasionally instances of hereditary ataxy, such as the pedigree of a stock recorded by Sanger Brown; other examples are to be found in angio-neurotic oedema, and certain eye conditions such as retinitis pigmentosa, senile cataract, coralliform cataract, nuclear or reticular keratitis, and, lastly, congenital stationary night-blindness—a most remarkable pedigree of which has been constructed by Cunier and Nettleship. I am showing this pedigree because it illustrates the fact that a variation or mutation is not easily swamped out by dilution with the normal. This remarkable pedigree comprises nearly 2,000 individuals, and extends back for ten generations; it commenced, so

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far as is known, with Jean Nougaret, born 1637; and subsequently 135 descendants of this individual were affected with congenital stationary night-blindness. Mendelians claim this as a proof of Mendelism, and assert that the congenital defect is dominant and the normal is recessive in this pedigree. Whenever normal parents of this stock have married, and in this family intermarriages between extracted normals have occurred, the offspring is always normal; at any rate this pedigree proves gametic segregation of alternate unit characters, whether numerically it follows Mendel's doctrines or not.

Another mode of transmission is termed sex-limitation; in this the transmission is not only discontinuous or interrupted in successive

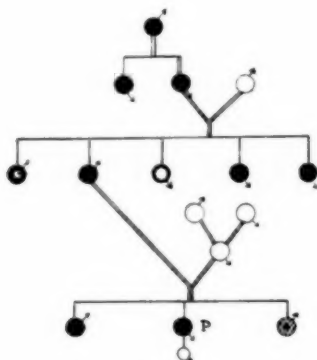


FIG. 4.

Paternal great grandfather suffered with chorea—also paternal grandmother and sister. Two paternal aunts and father suffered with chorea and died in asylums or infirmary—brother physically unsound and sister suffered with nervous disease. P, the patient, chorea and insanity, one brother in asylum and one died. It will be observed that the maternal side is quite free from any taint. Black circles indicate members of the stock affected with chorea; shaded circle, dead in infancy; circle with deep black rim, physically unsound; black circle with white centre, physically unsound.

generations, but the disease is limited to one sex; and in addition there is this extraordinary peculiarity, the disease is transmitted by the sex in which the disease does not appear. It is the males who are affected in these hereditary sex-limited diseases; it is the females who transmit it.

The most striking examples of this mode of inheritance are Daltonism, or colour-blindness, hæmophilia, pseudo-hypertrophic paralysis

and certain allied conditions, as well as Leber's disease. Some authorities dispute the sex-limitation of these diseases; in any case it may be asserted with confidence that these diseases are almost, if not entirely, sex-limited.

If defects, abnormalities, diseases, or predispositions to disease are continually arising by germinal variations, and are not readily swamped out by dilution with normal stocks in a series of generations, what prevents every stock of the whole race becoming affected and degenerated? Before attempting to answer this question, I will call your attention to the neuroses and psychoses and their inheritance, or, rather, tendency to inheritance, owing to the inborn factor of what we may term the neuropathic tendency existing in one or both of the parental stocks.

It has been shown by Galton, Pearson, and others that just as physical characters are inherited from ancestral stocks, so likewise are the mental characters; and Galton, in his work on Natural Inheritance, has shown that the tempers of ancestors may be repeated in the descendants; there is therefore gametic segregation of temperaments, as there is gametic segregation of physical characters; so that in a family a child may resemble the father or the mother, or, perhaps, some more distant relative, in its physical characters, or in its temperament or mental qualities. Such being the case, we can understand why, in a family, the parental stocks of which exhibit neuropathic tendencies, only certain individual offspring may inherit those tendencies.

NATURE AND NURTURE.

No child is born insane, although it may be born feeble-minded, from actual cerebral deficiency. In every case of neurosis or psychosis, we should endeavour to ascertain what the individual was born with (nature), and what has happened at or after birth (nurture). To ascertain the inborn factor, it is necessary to study the parental characters and those of the parental stocks. To collect statistics merely relating to the question of certifiable insanity or epileptic fits is quite insufficient, for the neuropathic tendency manifests itself in multiform ways, and it is necessary to seek the first stages and less obvious conditions of degeneration in a stock. Morel, who studied this question fifty years ago, pointed out that nervous irritable weakness, that which we term the neurotic temperament, may be the first evidence of a progressive degeneration in the stock.

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The morbid neurotic temperament may be manifested in a variety of ways by the conduct and behaviour observed in various members of the stock. The signs of degeneracy which may be exhibited are self-centred narrow-mindedness in religious beliefs, fanaticism, mysticism, and an unwholesome contempt for traditional customs, social usages, and morality, often combined with a selfish, self-seeking, vain spirit of spurious culture, or by a false sentimental altruism, or by eccentricities of all kinds; such signs of degeneracy are frequently combined with talent, and often genius, but the brilliant intellectual qualities of a degenerate are invariably associated with either a lack of moral sense or of sound judgment and highest control (fig. 5).

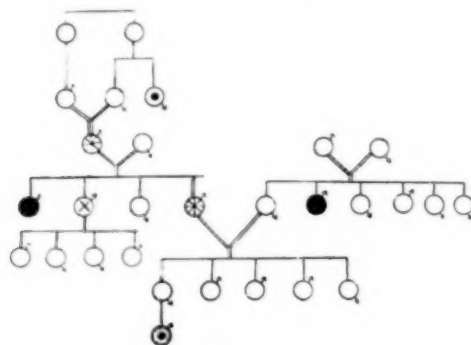


FIG. 5.

A pedigree illustrating marriage of first cousins; a genius the product, who married a healthy woman, and the family consisted of an eldest son insane, black figure; a second son committed suicide, X; a daughter healthy, and fourth son genius, figure with star. This man was a genius, but had an extremely well-balanced mind; all his five children are healthy.

An unsound stock may have successful men in the eyes of the world, but these may really form the first step in the process of degeneration; for the avarice and moral guile which made them "pillars of society" may come out in the next generation as gross criminality or insanity.

The Melancholic Temperament.—I have often found in the collecting of pedigrees that degeneracy and insanity in a stock is preceded by, or associated with, the existence of individuals possessing the melancholic, suspicious, hypochondriacal, despondent, gloomy, self-regarding temperament; and it is not uncommon for suicide of one or more

members of the stock in successive generations to occur. The melancholic temperament may, however, be associated with unusual abilities and great power of attention and concentration. With these temperamental evidences of degeneracy of a stock may be hysteria, hypochondriasis, psychasthenia, neurasthenia, migraine, petit mal, or neuroses of an epileptic character, unrecognized because not manifesting the characteristic fits of the major form of the disease—e.g., epilepsy may present the form of automatism and sudden criminal impulsiveness. Consequently, in taking a family history, there are many possibilities of missing the inborn factor of a neurosis or psychosis, even though a considerable amount of care and industry be expended, combined with intelligent co-operation on the part of the friends (figs. 6 and 7).

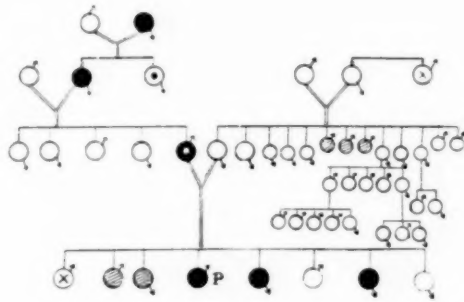


FIG. 6.

Four generations; all the unsound taint from one stock, in the fourth generation. P., patient, murderer and lunatic; the eldest brother committed suicide and there were two sisters insane; two children died young (shaded circles), and a boy and girl healthy. The ages of onset not known, except that the murderer was only a lad.

I have purposely refrained from mentioning alcoholic intemperance and the habit of drug-taking so common in degenerates of all kinds; the habit may be the cause or the result of the degeneracy. I am, however, of opinion that various causes, such as alcoholism, infective diseases, auto-intoxications, physical injury, especially head injuries and shocks, emotional shock, sexual excesses, and unnatural practices are too often wrongly assigned as the *sole* cause of nervous and mental disease, to the neglect of the inborn factor (fig. 8). In nervous and mental, as in bodily disease, there are nearly always two factors—viz., the soil and the seed, the inborn and the acquired environmental. There are individuals born of sound stocks, that no acquired conditions—e.g., drink,

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poisons engendered within the body or taken from without, head injuries, emotional shock, distress and even profound misery and destitution combined—can render insane. There are others, and these are generally from a neuropathic stock, whose mental equilibrium may be disturbed by any one of these conditions or very frequently, as my further observations will show, without any apparent cause except the conditions appertaining to the sexual functions in adolescence, the puerperium, and the involutional or climacteric period.

I am of opinion that the more time and trouble taken to obtain a history, the more frequently an inborn factor will be found to account partly, if not wholly, for the appearance of insanity in a stock. To take

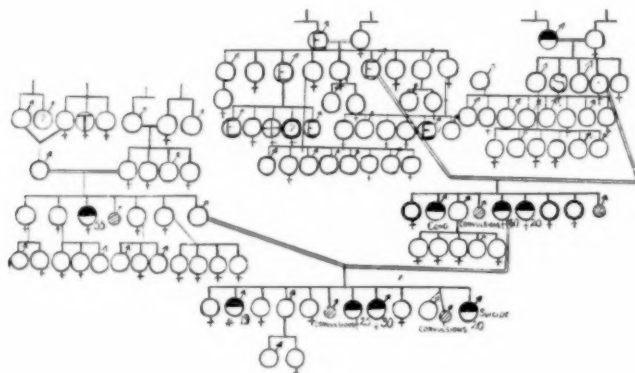


FIG. 7.

Pedigree by Dr. Wilson White. E, epileptic; S, suicide; cross in circle, drink; half black, insane; those with a star, found dead. Anticipation is shown, but the interesting part of this pedigree is that, in the fourth generation, four out of twelve born alive are insane at an early age, probably dementia præcox; two died in infancy of convulsions. The deep-black-rimmed circles are neuroses or nervous disease. It will be observed that the unsound taint came especially from the maternal side. Careful inquiry showed that most of the sane members of this stock were of a melancholic temperament. On the father's side there was very little hereditary taint; only one male insane. This stock, generally speaking, had members with a sanguine temperament. The sound members of the fourth generation probably inherited more from this stock than the mother's; the converse with the unsound members.

an example, two brothers are at present in Claybury, named Martin and Luther; the notes did not indicate any inborn factor. I interviewed the father, a very intelligent, excitable old man; he told me that he had named his sons Martin and Luther after the defender of the

faith. He was a total abstainer, a very religious man; he was formerly a ship's engineer; he left the service because he refused to work on Sunday, and he laid the ship up rather than do this. He had invented many patents, some of them very clever, and his sons had been engaged with him in these enterprises. He attributed their mental breakdown to business worries on account of the failure of the patents.

Another case I saw in which there were three sisters who were affected with adolescent insanity, in which there was said to be no neuropathic history. I found the father had suffered with petit mal and migrainous attacks, for which he had been treated at the National Hospital.

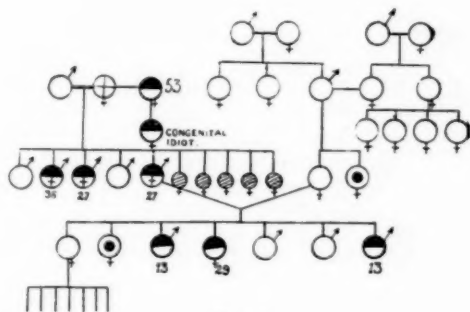


FIG. 8.

A family of drunken and insane people. The figures with half-black circles are insane; the same with the cross indicates drink and insanity. The clear circle with a cross, drink only in the history. The heredity begins with a drunken woman; in the next generation there are two normal, three drunk and insane beginning at an earlier age, and the five youngest die in infancy or are born dead. One of the drunk and insane marries a healthy woman of a good sound stock: there are six children; three are insane in early life, three are healthy; the eldest with seven healthy children; the second clear circle with black centre indicates bodily disease. I used to give this as an instance of drink producing insanity, but after the establishment of the card system I found the sister of the drunken grandmother died in Colney Hatch Asylum after having been there twenty years; her daughter was a congenital imbecile at Leavesden.

I could give numbers of instances like this where careful search in apparently non-hereditary cases shows that an inborn factor has existed.

Figs. 5, 6, 7 and 8 illustrate some of these points.

Perhaps one of the worst forms of degeneracy is vagrancy, or inability or absence of desire to exist by individual endeavour. I have

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a number of pedigrees obtained from the relieving officers showing pauperism, drunkenness, insanity, and tuberculosis. Here is one of four generations, in which we find a large number of members of the stock who have been in the workhouse infirmary as paupers, or in the asylums; many of them are blind in successive generations; whether this is an hereditary optic atrophy I do not know (fig. 9.).

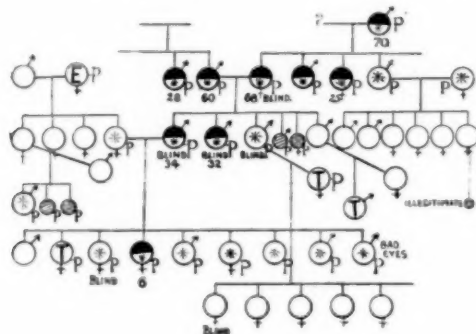


FIG. 9.

Four generations in which P, pauperism, E, epilepsy, tuberculosis, insanity, and drink are shown together with blindness. Mr. Lidbetter, the relieving officer, furnished me with the details of this pedigree.

REGRESSION TO THE NORMAL.

If defects, abnormalities, diseases, or predispositions to disease are continually arising by germinal variation, and if morphological defects, as we have seen in the case of congenital stationary night-blindness and other conditions, such as brachydactylism, polydactylism, &c., are not easily swamped out by dilution with normal stocks in a series of generations, what prevents the race becoming more infected by such abnormalities?

There is always the tendency to regression to the normal average of the species and of the race. The germ-plasm of normal stocks is endowed with that dynamic, stable equilibrium which has been fixed for countless ages by evolution in the struggle for existence and survival of the fittest by adaptation to environment. By this means heredity acts as the great fly-wheel in the mechanism of the evolution of the species. Nature has, however, evolved other methods of preventing imperfections and poor mental and physical types from becoming perpetuated. Nature, unmindful of the individual, and mindful only of

the species, has adopted a quicker method of weeding out and killing off the poor types; it is by increasing their susceptibility in successive generations to ubiquitous germs or poisons—e.g.,¹ tubercle and alcohol. Another of Nature's methods is to intensify the disease or predisposition to disease and to bring it on at an earlier age and even at birth, thus anticipation or antedating renders the unsound members of the stock less able to survive in the struggle for existence by reason of the disease impairing seriously their mental or physical powers. I mean especially the struggle for existence in the sense of Malthus and of Darwin, the struggle for the necessities of life among members of the same species, namely, the human struggle.

THE LAW OF ANTICIPATION.

I am indebted to Mr. Nettleship, who has done so much to advance our knowledge of the hereditary transmission of disease, for calling my attention to this law. He has defined anticipation in hereditary disease as a manifestation of the morbid change at an earlier age either in members of each succeeding generation as a whole, or in successively born children of one parentage.

Darwin in his "Animals and Plants under Domestication" refers to anticipation thus: "There is a strong tendency to inheritance to disease at corresponding periods of life. When the rule fails, the disease is apt to come on earlier in the child than in the parent, exceptions in the other direction being much rarer."

Dr. Lucas alludes to several cases of inherited disease coming on at an earlier period. Mr. Bowman remarks that this frequently occurs with cataract.

Nettleship gives some interesting facts and pedigrees of anticipation in diabetes and glaucoma and he has collected a number of pedigrees in which the age at death is stated in the diabetic children of diabetic

¹A comparison of the phthisis death-rate at the several age-periods per sane living in London, and per 1,000 of the total living insane population (18,872), resident in the London County Asylums, shows that the mortality from phthisis among the insane is highest at a much earlier age-period than among the sane. At the age-period 45-55, when it reaches its maximum among the sane, it is a question whether the incidence among the insane is much greater than among the sane pauper population. The comparison also shows that the death-rate from phthisis for the insane between the ages of 15-35 is about fifteen times that for the sane for the same age-period. Allowance, however, must be made for the fact that the majority of the inmates of the asylums belong to the poorest classes. This conclusion I arrived at from a careful investigation of "Tuberculosis in the London County Asylums" after five years of notification. The full paper is published in *Archives of Neurology and Psychiatry*, vol. iv, 1909, pp. 70-116.

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parents. Thirteen diabetic children of diabetic parents died at the average age of 25; ten diabetic parents of the above offspring died of diabetes at the average age of 51. Bence Jones, Pavy, and Naunyn recite cases illustrating antedating in hereditary transmission of this disease. Dr. Albert Gray has furnished me with three pedigrees of oto-sclerosis showing antedating. Nettleship, in his Bowman Lecture, remarks that anticipation appears to occur in phthisis, and he refers to Pollock's "Medical Handbook of Life Assurance," 4th edition, 1895, and Karl Pearson, "A First Study of the Statistics of Pulmonary Tuberculosis," 1907.

From the study of pedigrees, I had observed early in my investigations on heredity that there was a general tendency for insanity not to proceed beyond three generations. There was frequently either a

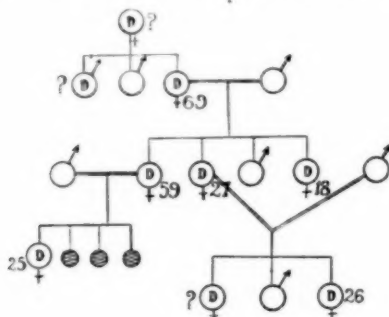


FIG. 10.

Pedigree of diabetes, after Nettleship.

regression to the normal type or the stock tended to die out. Not infrequently the stock died out by the inborn tendency to insanity manifesting itself in the form of congenital imbecility, or in the insanity of adolescence. Such patients, especially paupers, are prone to die of tuberculosis: thus rotten twigs are continually dropping off the tree of life. Morel, in 1859, pointed out that progressive uninterrupted transmission leads finally to special degenerative forms, to imbecility and idiocy, and with the diminished capability of propagation of the latter kind the stock therefore gradually became extinct.

Antedating and intensification of heritable disease, or predisposition to disease, would not only lead to diminished vital resistance to poisons or germs of disease such as alcohol and tuberculosis, but also, owing to

lack of physical and mental ability to obtain the necessities of life, vital resistance is still further diminished, so that the tendency is for the unsound members of the third or fourth generation of a mentally degenerate stock to die at a comparatively early age, of some intercurrent disease, especially tuberculosis, and thus propagation is prevented. Again, the earlier the disease or defect appears, and the more intense its form, the less likely is marriage to occur and offspring to be born; moreover, obvious inherited disease or congenital defect, such as harelip, cleft palate, and even predisposition by inheritance to insanity or epilepsy, interferes with marriage and parentage among the better classes; un-

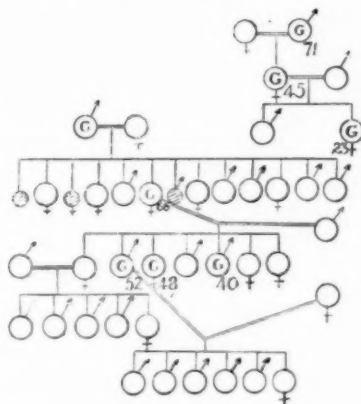


FIG. 11.

Pedigree of glaucoma, after Nettleship.

fortunately it does not interfere with marriage or mating and parentage among the lowest, most fertile, least desirable classes of the population.

Sterility often accompanies marked mental deficiency, but there is no limit to the fertility of the higher-grade imbecile; in fact, the poorer the stock in mental and physical power and civic worth, the more prolific it is. In our cities and large towns venereal disease sterilizes very soon the great bulk of women who lead immoral lives; this is not so in the country districts, where a weak-minded woman may have a large number of illegitimate children. A great source, in my opinion, of national degeneracy is the prolific higher-grade imbecile.

Before considering the evidence which I have obtained of this law of anticipation in relation to neuropathic and psychopathic degeneration of stocks, I would like to call your attention to some interesting

observations on this subject by Nettleship. He says: "Anticipation or antedating of onset or of completion in a family might be taken to show the transmission of an acquired character. But it probably may be explained as well or better by assuming that certain defects, taints, or vices of the system, say of the blood, are not only hereditary in the true or germinal sense, but able to produce toxic agents in the embryo, which have an evil influence on all its cells, and thus so lower their power of resistance that the innate hereditary factor has freer play, and is likely to manifest itself earlier. There may also be toxic agents in the embryo that have no relation to the hereditary vice, but yet may and probably do act in a similar manner as excitants of the disease."¹

I cannot here discuss the chromosome theory, but it is generally assumed that there is a particulate inheritance derived from the nuclear substance of the male and female germ-cell in the fertilized ovum, and that the nuclear substance derived from each parent is equal in amount. This seems to be proved by the facts observed concerning the reduction of the chromosomes in the process of maturation of the male and female germ-cells. Weismann adopted the chromosome theory of germinal determinants, and Nettleship has modified a diagram of a scheme of transmission by Ziegler. Let us see what it shows.

A represents the male parent; his immature germ-cells have derived their chromosomes, germinal determinants or representative particles (Galton) from his father and mother, and they are respectively represented by different figures. The eight germ-mature chromosomes are reduced to four during maturation, two from each parent; the figures A—F indicate the combination of two maternal with two paternal, all diseased, but in different degrees and modes. B represents the female parent, in which there is an inherited taint, but only to a slight degree, coming from the maternal side; in the mature germ-cells only one containing number 13 will be tainted. C shows some of the results which may arise from the conjugation of $A \times B$.

Assuming the intensity of inheritance is constant for each chromosome or other unit of germ-plasm, but to vary with the number of the germinal units tainted, we have as a result of the mating of these two tainted stocks all degrees of manifestation of ancestral characters from perfect normality to the most profound disease. The more numerous the tainted germinal units the greater will be the chance of the disease appearing in the offspring. On the other hand, the oftener reduction, with its possible random arrangement, has occurred—i.e., the greater

¹ *St. Thomas's Hosp. Gaz.*, 1910, p. 61.

the number of generations—the less will be the chance of any particular character finding a place in the inheritance (Nettleship).

Certainly this idea of the scheme explains certain facts which have been observed in the pedigrees I have shown; it shows why the offspring of parents derived from two tainted ancestral stocks are more likely to suffer with an intense form of the disease; it shows also why more of the offspring are liable to be affected and it shows why a certain proportion of the offspring may escape entirely; but according to the hypothesis thus advanced it does not explain why only relatively few of the offspring are tainted as compared with the numbers born, even though there be convergent neuropathic inheritance, that is, the germinal determinants of both parents may be largely tainted and yet fewer offspring are affected by the disease than would be expected. In neuroses

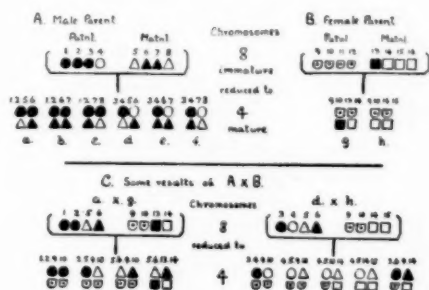


FIG. 12.

Transmission of a defect in different degrees by the same parents.

and psychoses it is not a disease that is transmitted but a predisposition or tendency, and some other factor than the inborn is required to produce the disease. If we ask ourselves the question, How could Nature best purify an unsound stock? the obvious answer would be, to cause coalescence or crystallization out of the unsound germinal determinants into a few of the offspring, leaving the germ-plasm of the others free. This would not only purify the stock by segregation but by concentration in one or two offspring; it would lead to intensification and anticipation of the disease. The diseased offspring would be unfit for the struggle for existence and propagation. In putting forward this coalescence theory of similar diseased germinal determinants, I may mention in support of it a statement made by Galton in his great work on Natural Inheritance. In the process of transmission by inheritance

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elements derived from the same ancestor are apt to appear in large groups, just as if they had clung together in the pre-embryonic stage, as perhaps they did.

Certain diseases when hereditary—e.g., diabetes, glaucoma and oto-sclerosis—show anticipation.

STATISTICAL DATA RELATING TO INHERITANCE AND INSANITY, ESPECIALLY IN RELATION TO ANTICIPATION.

About three years ago I instituted a card system for indexing the notes concerning patients resident in the London County Asylums whose relatives at some time or other were also inmates of these asylums.

By February 18, 1911, I had notes of 2,246 such cases which showed the following relationships:—

INSTANCES OF TWO OF A FAMILY INSANE.

				Pairs	Cases
Mother and daughter	..	...	...	111	222
Mother and son	...	...	...	64	128
Father and daughter	...	...	...	72	144
Father and son	...	...	...	52	104
Brothers and sisters	...	...	...	163	326
Two sisters	...	...	...	159	318
Two brothers	...	...	...	105	210
Husband and wife	...	...	...	49	98
Other relationships, collaterals, &c.	...	...	...	138	276
Total				913	1,826
108 instances of 3 of a family insane	...	...	...	...	324
17	..	4	..	...	68
3	..	5	..	...	15
1	..	6	..	...	6
1	..	7	..	...	7
Total				...	2,246

Total—2,246 cases, made up from 1,043 families.

Since that time, however, a large number of cases have been added, and the total now reaches about 2,800, and on these cases the following statistical investigations have been made.

The material supplied 508 pairs of parent and offspring (from the records of 464 insane parents whose 500 insane offspring have been also resident in the London County Asylums), and in these the age at the time of first attack has been investigated.

The following table is compiled from 217 pairs of father and offspring, and 291 pairs of mother and offspring. The figures denote the percentage of cases whose first attack occurred within the given age-periods.

Age-periods	Father	Offspring	Mother	Offspring
Under 20 years ...	1.4	26.2	0.6	27.8
20-24 " ...	0.4	18.0	3.4	15.7
25-29 " ...	1.4	18.0	4.4	18.2
30-34 " ...	9.6	13.0	7.8	13.4
35-39 " ...	11.5	7.3	9.2	10.0
40-44 " ...	9.2	6.4	10.3	5.8
45-49 " ...	14.3	6.0	12.0	3.7
50-54 " ...	17.5	0.9	12.3	2.4
55-59 " ...	13.8	3.7	14.0	1.7
60-64 " ...	10.1	—	11.6	1.3
65-69 " ...	5.0	—	8.8	—
70-74 " ...	4.6	0.4	3.1	—
75-79 " ...	0.4	—	1.3	—
80 " ...	0.4	—	0.6	—

These figures are shown graphically in the following diagram, the abscissæ representing the age-periods, and the ordinates the percentage

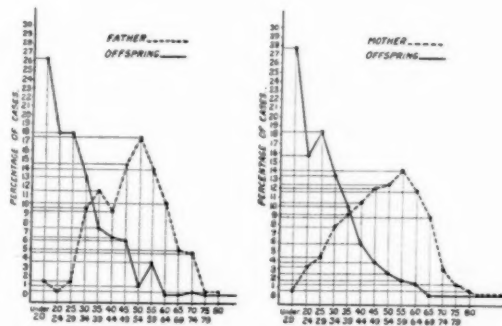


FIG. 13.

of cases whose age at the time of first attack falls within the given periods. (Fig. 13.)

Investigating the ages at the time of first attack in the insane offspring of insane parents, I find in the following pairs that 239, or 47.8 per cent., out of 500 offspring had their first attack at or before the age of 25 years:—

Mother—son ...	...	...	51 out of 118 offspring
Mother—daughter ...	...	...	81 " 170 "
Father—son	45 " 90 "
Father—daughter	62 " 122 "
Total	239 out of 500 offspring = 47.8 per cent.

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The following table shows the average age at the time of first attack in parent and offspring:—

	AVERAGE AGE	
	Parent	Offspring
120 pairs mother—daughter	49·7	29·3
67 „ mother—son	50·2	30·7
76 „ father—daughter	50·1	30·4
51 „ father—son	51·9	33·1
79 parents, 133 offspring in families with more than 2 insane	47·7	28·7
Total: 393 parents, 427 offspring ...	49·7	30·0

In addition there were seventy-one parents whose average age was 49 years at the time of first attack, who were associated with imbecile offspring.

Lastly, I find that in 299, or 58·8 per cent., of the 508 pairs of insane parent and offspring, the first attack in the offspring occurred at an age twenty or more years earlier than in the parent; of these 299 instances seventy-three of the offspring were imbeciles.

COLLATERAL HEREDITY.

The following table is compiled from 193 pairs of uncles and aunts with nieces and nephews in which only collateral heredity is manifested, and 231 pairs of uncles and aunts with nieces or nephews, in which are included those instances where one or both parents of the nieces and nephews are also insane. The figures denote the percentage of cases in which the first attack occurred within the given age-periods:—

Age-periods	COLLATERAL ONLY		COLLATERAL AND DIRECT	
	Uncle or aunt	Niece or nephew	Uncle or aunt	Niece or nephew
Under 20 years ...	5·2	20·7	5·2	25·5
20-24 „ ...	3·1	19·2	3·4	17·7
25-29 „ ...	6·2	18·6	7·8	19·0
30-34 „ ...	12·9	17·1	14·3	15·1
35-39 „ ...	11·9	12·4	12·1	11·2
40-44 „ ...	11·3	5·7	10·4	4·3
45-49 „ ...	12·4	2·1	12·1	2·6
50-54 „ ...	14·5	2·1	12·1	1·7
55-59 „ ...	7·7	1·5	8·6	2·1
60-64 „ ...	8·8	—	8·2	—
65-69 „ ...	1·5	0·5	1·7	0·4
70-74 „ ...	1·0	—	1·3	—
75-79 „ ...	3·1	—	2·6	—
80 „ ...	—	—	—	—

Adolescence

Involuntional period

These figures are shown graphically in the following diagram, the abscissæ representing the age-periods and the ordinates the percentage of cases whose age at the time of first attack falls within the given periods. (Fig. 14.)

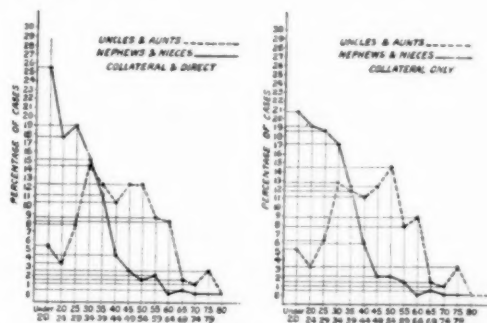


FIG. 14.

Of the insane nieces and nephews of insane uncles and aunts, 103 out of 208, or 49.5 per cent., had their first attack at or before the age of 25 years.

Uncle—nephew or niece	...	...	...	51 out of 93
Aunt—nephew or niece	...	...	...	52 " 115
Total	...	...	...	103 out of 208 = 49.5 per cent.

SOME FAMILY RECORDS SHOWING ANTICIPATION.

Father—Involutional melancholia, 54.

Children—

- (1) Congenital imbecile, epileptic, male.
- (2) Adolescent insanity, female, aged 23.
- (3) Paranoia, adolescent insanity, male, aged 22.

Niece—Adolescent insanity, female, aged 19.

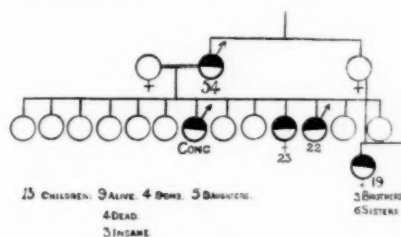


FIG. 15.

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I—*Grandfather*—Mania, recovered.

II—*Aunt*—Alternating insanity at 45; still in asylum.

Mother—Puerperal insanity at 22; recovered.

Offspring—Both dementia præcox; girl discharged.

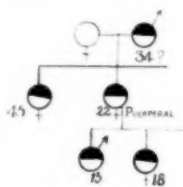


FIG. 16.

Father—Recurrent insanity, alcoholic, first attack at 46; recovered.

Offspring—

(1) Female: Recurrent insanity, aged 15; still in asylum.

(2) Female: Recurrent insanity, aged 13; still in asylum.

(3) Male: Recurrent insanity, aged 15; recovered.

(4) Female: Recurrent insanity, aged 23; still in asylum.

(5) Male: Melancholia, aged 16; died in asylum.

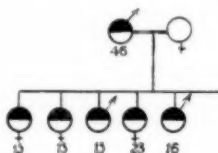


FIG. 17.

I—*Maternal*—

Aunt—Delusional insanity (non-systematized); died in asylum.

Mother—Melancholia at 58; discharged.

Father—Recurrent insanity, aged 42; eventually died in asylum.

Offspring—Both adolescent insanity, and still in asylum.

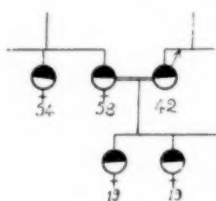


FIG. 18.

Mother—Dementia at 57; died in asylum.

Children—

- (1) Male: Recurrent insanity, two attacks; recovered.
- (2) Female: Recurrent insanity; still in asylum.
- (3) Female: Congenital imbecility; still in asylum.
- (4) Female: Congenital imbecility; still in asylum; has been in prison several times.

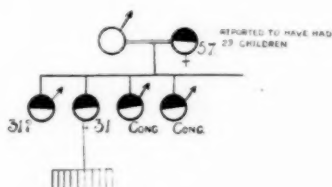


FIG. 19.

Grandfather, Paternal—"Died an imbecile."

Paternal Aunt—Recurrent insanity, aged 31; died in asylum.

Paternal Uncle—Recurrent insanity, aged 45; died in asylum.

Offspring—

- (1) Male: Recurrent insanity, aged 19; still in asylum.
- (2) Male: Dementia, aged 32; still in asylum.

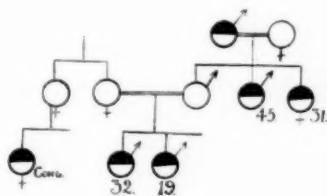


FIG. 20.

CONCLUSIONS AND INFERENCES.

What conclusions may be drawn from these collective statistics and curves which I have shown you in respect to transmission and anticipation?

First, I should remark that there are more women in asylums than men; there are about three times as many male general paralytics as

female, and that about 1 to 4 of the deaths occurring in asylums are from general paralysis. Therefore the number of paralytics in an asylum is not a measure of the numbers that would occur in a card system of relatives who are at present, or who have been, in the asylums, because the average duration of life after the onset is comparatively short: nevertheless the number of general paralytics occurring among these relatives is comparatively small. This is really what we should expect if we consider this disease to be due essentially to the acquirement of syphilis and not an inborn taint of a stock. Yet probably an insane predisposition or a neurotic temperament would make a syphilitic subject more liable to the disease.

It will be observed from the accompanying tables that females more often occur among the relatives than males, the proportion being much larger than exists between male and female inmates of asylums, which is about 11 to 9. In the offspring of insane parents, daughters are much more numerous than sons—viz., in the proportion of 292 to 208. These figures show that the female sex in a stock is more liable to become insane. The figures do not seem to show that the mother is more liable to transmit than the father, for the pairs of mother and son to father and son bear the proportion of 67 to 51, which could be accounted for by the fact that the female sex is more liable to become insane.

Next, let us see what the tables show as regards the age-periods of first attack in parent and offspring. I may here remark that congenital imbeciles are not sent to the London County Asylums unless for some special reason, and then not until they are past puberty, as a rule, so that I had to include, under twenty, imbeciles and cases of early adolescent insanity. Whether we look at the tables and curves in which the number of cases form the ordinates and the age-periods the abscissæ, or the tables and curves compiled from the similar 217 pairs of father and offspring and 291 pairs of mother and offspring, in which the percentage of cases whose first attack occurred within the given age-periods are the ordinates, it is obvious that the great majority of the offspring are affected at a much earlier age than the parents; that is, there is anticipation or antedating. Whereas the great bulk of the offspring are either affected at birth or in adolescence (62 per cent. are under 30), by far the greater incidence in the parents is in the involutional period (45 to 60).

The female curves of the offspring do not quite coincide with the male, but there is less divergence than between the parents. I will

endeavour to offer some explanation of these facts. There is a steady increase of the mothers at each period from 20 onwards to 60; this corresponds at first to the child-bearing period, especially 20 to 30; here there is a marked difference in the percentage between mothers and fathers; after this up to 40 the percentage of fathers predominates, although the female curve is steadily rising. I think the steady rise of the female curve is due to puerperal insanity; the increase of the males between 30 and 40, shown by a peak in the curve, is probably occasioned by a preponderance of the few relatively male general paralytics.

In conformity with the results of direct heredity in parents and offspring are the results obtained by the comparison of the tables and the curves of collateral relationship, viz., uncles and aunts and nephews and nieces. It will be observed that the same general results of the age-incidence of the two generations are shown, although there are some striking differences. If a comparison be made of the curves when there is collateral relationship only, with that of parent and offspring, it will be noticed that there is, as we should expect, a larger number of uncles or aunts in the earlier periods, and rather fewer of nephews and nieces than in the case of direct heredity. But when we add those instances where there is direct as well as collateral insanity by including the offspring of insane parents with uncle or aunt insane, then with this more intense form of heredity added we find a larger proportion of nephews and nieces become insane in adolescence. This is shown by a higher peak in the curve at an earlier period.

I have not enough records of grandparents to draw any reliable conclusions as yet. I do not mean to affirm that there may not be some errors in the data upon which these collective statistical investigations have been made, but I think that such simple fact as age on first attack, involving as it does no personal equation on the part of the medical men, affords a useful basis for reliable statistics. I admit that admission to an asylum may not really be the first attack either in parents or offspring or collaterals in a number of cases, but when dealing with the poor who are unable to keep an insane relative in their home, and taking into consideration the large number of cases and the systematic plan adopted, I think the facts are sufficient to prove that the Law of Anticipation is one method by which Nature seeks to either end or mend a degenerate stock.

I have not yet a sufficient collection of facts regarding the proportion of offspring born of an insane parent that become insane, but without precise data, and from a study of a number of pedigrees, I should say

that it is about 1 in 4 or 5; if, however, the ancestral stocks on both sides are tainted, it is more than this.

These curves and figures seem to show that if the offspring of an insane parent passes adolescence he has a very good chance of not inheriting the taint. Are we justified in supposing that anticipation can purify a stock? That is to say, if one or more are insane at an early period of life, will the others that are sane transmit to their offspring? That is to say, is there any probability that if these members marry into *sound* stocks the inheritance will be sound? In other words, is my hypothesis of anticipation as a coalescence of the unsound germinal elements with gametic segregation of them, leaving the other gametes free or relatively free, in accordance with facts? Or is anticipation to be explained by the fact that the germ-cell from which the insane offspring has developed is as old as the body-cells of the parent, and therefore has been subjected to the same bio-chemical influences? Further work is in progress to show what proportion of offspring become insane with direct and collateral heredity and convergent heredity: also what relation there is between the birth of offspring that become insane and the attack of insanity of the parent. Some interesting facts have also been made out regarding similarity of inheritance and the influence of race, which may be summarized as follows:—

TENDENCY TO INHERITANCE OF THE SAME TYPE OF INSANITY.

Dr. Edgar Schuster made a bio-metric investigation of the above material, and his results have been published in the Annual Report of the Asylums Committee for the year ending March 31, 1910. His conclusions are as follows:—

(1) A periodically insane son or daughter is more likely to be associated with a periodically insane mother or father than with one differently affected, and in the case of two offspring being insane there is even a greater tendency for a periodically insane male or female to be associated with a periodically insane brother or sister than with one differently affected.

(2) In the case of delusional insanity the tendency for the affection to run in families is very strongly marked, and the correlation between the members of the same co-fraternity is more strongly marked than between parents and offspring.

(3) In the incidence of primary dementia of adolescence there is a strong correlation between members of the same co-fraternity; there

is also a decided tendency indicated for the brothers and sisters of imbeciles to be also imbeciles.

(4) There is no indication of general paralysis running in families. This is not surprising, as it is now recognized to be an acquired disease due to syphilitic infection.

RACIAL INHERITANCE.

It has always struck me that Jews were, on account of their neurotic temperament, more liable to insanity than Christians. The following statistics seem to support this inference.

All the insane Jews are admitted to Colney Hatch Asylum. The number of cards belonging to Jews in this asylum is eighty; the number belonging to the non-Jewish inmates is 254. The total number of inmates is 2,450, and of these 459 are Jews, so that less than one-fifth of the total population is Jewish. A little more than one-fourth of the relative cards belongs to Jews, so that the incidence of ascertained relationship among the Jewish inmates is considerably more than among the non-Jewish. No doubt the temperament of the Jews renders them as a race more liable to the neuropathic tendency, but the greater incidence of ascertained relationship among the Jews is partly due to the following facts: They are more often visited by their friends, they have more pride of family, and as a rule are more intelligent and anxious to afford information. But to counterbalance this it must be remembered that the greater number of these Jews are aliens who have come from Russia and know nothing about the relatives who may be there, or who have emigrated to the United States. Probably, therefore, this rather under-estimates than over-estimates the proportion of Jews with insane relatives as compared with Christians.

Maudsley in his philosophical work on "The Pathology of Mind," a book, in my opinion, far too little read, says: "There appears to be at work a silent tendency in Nature to restore an insane stock to a sound type if regeneration be possible, or to end it if its degeneration be such that it is too bad to mend." This conclusion, which he has arrived at from a wide experience and knowledge combined with philosophical deduction, seems to be proved by the facts which I have brought to your notice.

Finally, it may be asked, if Nature is continually purifying stocks, how comes the pollution? All biologists, even those who do not believe

in the transmission of acquired characters in the Lamarckian sense, admit that nutritional conditions may be a source of variations occurring in the germ-plasm. The germ-cells are nourished by the same blood and lymph as the body-cells, and prolonged changes in the blood caused by poisons introduced into the body may induce permanent bio-chemical alterations in the blood and lymph, which would therefore be capable of affecting the germ-cells, especially during maturation. Thus syphilis, alcohol and tuberculosis may modify the nutrition and cause pathological variations in the germinal determinants of the latest acquired structure of the body, viz., the cortical neurones, not necessarily affecting them structurally, but only nutritionally and in their specific vitality, causing a tendency to an unstable nervous condition which may be the starting point of degeneracy of a stock, especially when added factors occur, such as the strife of city life with its feverish pursuit of gain and pleasure, competitive examinations, the constantly increasing departure from simple modes of life, the unphysiological conditions of sexual life, and the extension of more refined physical and mental enjoyments, bringing with them desires and emotions previously unknown.

Neurological Section.

November 23, 1911.

Dr. F. W. MOTT, F.R.S., President of the Section, in the Chair.

The Complete Histo-pathological Examination of the Nervous System of an Unusual Case of Obstetrical Paralysis Forty-one Years after Birth, and a Review of the Pathology.

By GEO. F. BOYER, M.B. (Toronto).

IN the following paper it is my intention to review the pathology and to describe the results of a complete histological examination of the nervous system of a case of obstetrical paralysis. The work has been done in the Pathological Laboratory of the London County Asylums; and for permission to work in the Laboratory and enjoy the exceptional facilities it offers for research, I am greatly indebted to the Asylums Committee. To Dr. Mott, the Director of the Laboratory, I would also express my thanks for placing this case at my disposal, and for his guidance and encouragement throughout the work.

CASE NOTES.

A. B., female, aged 41, was admitted five and a half years ago to Claybury Asylum suffering from puerperal melancholia, with filthy delusions, accompanied by marked excitement at times.

I have personally interviewed the mother of the patient and obtained the following information: She was a full-term child; the labour was difficult and prolonged. The right arm presented, and for two hours

was left with the hand protruding from the vulva; then the accoucheur brought down a leg (? which), and after great traction the child was delivered. The child was very blue and was resuscitated only after prolonged efforts. The child did not breathe properly for some hours. Very soon after birth the mother noticed the infant did not move the right arm, and this paralytic condition has persisted. As a child sensation in the limb was believed to have been perfectly normal by the mother. The right leg was never weak or paretic during childhood. She was always very healthy and had no acute illnesses. There is no history whatever of anterior poliomyelitis.

The patient was married seventeen years ago and has had four children, two of whom are alive and healthy, and two are dead. There were no miscarriages. Fourteen years ago she became insane after the birth of a baby, but recovered at home in a few months' time after the death of the child. She became insane five and a half years ago on being confined, and was sent to Claybury Asylum where she has remained since. She was well, and of a cheerful and normal temperament during the interval.

Clinical examination on admission to the asylum: The patient was a female of slightly under average stature but with fair nutrition. No cardiac, pulmonary, or abdominal lesions were found. She could walk perfectly well. There was no facial or cranial nerve involvement. There were no external signs of syphilis. The pupils were equal, regular, and reacted to light. The right arm was extremely atrophied and flaccid and was maintained in a position of slight flexion at the elbow. The forearm was in a position midway between pronation and supination (dorsum of the hand looking outwards) and the third, fourth and fifth fingers were flexed on the palm to a relatively increasing extent. The forefinger and thumb were also in a position of moderate flexion. The right shoulder-girdle was atrophied and especially the pectoral muscles. Her right trapezius was quite powerful. She had very little, if any, power in the right biceps. She had some adduction of her arm (could carry a book between her arm and body). There was very slight power of flexion of the third, fourth and fifth fingers. There were never any subjective symptoms about heat or cold and pain in the arm (the afferent impulses were not tested because of her mental condition). She had fair use of her left arm, forearm and hand (could lace her boots and even sew).

During the past three or four years she has been losing power in her right leg; she was much weaker upon it at some times than at

others. She could always walk, even up to the time of her death. The knee-jerks were not obtained on either side. A gradual atrophy of the leg has developed during the past three or four years. She died in November, 1910, of broncho-pneumonia, at the age of 41, after a comparatively short illness and without any marked rise of temperature being recorded.

AUTOPSY REPORT.

The subject was a female of poor musculature and rather small stature. Her weight was 42 kilos (96½ lb.) The autopsy was performed ten hours after death. The body showed no marks of syphilis. The pupils were equal and regular. The right arm was very atrophied. The fingers were all shortened, and the third, fourth and fifth fingers were flexed on the palm. The right leg showed a general muscular atrophy. Mensuration (in inches):—

	Right	Left
Shoulder to thumb	15½	19½
Circumference at middle of arm	6½	7½
Circumference at middle of forearm	5½	6½
Length of lower limb	33½	33½
Circumference at top of thigh	15½	17½
Circumference just above knee	11½	12½
Circumference at middle of calf	11	12

The heart and large vessels and abdominal contents were all natural. The uterus and tubes showed no evidence of disease. The lungs showed a well-marked bilateral broncho-pneumonia without any signs of tuberculosis. The calvaria was normal. The meninges were natural, except the arachnoid mater, which was slightly less transparent than normal. No macroscopic brain lesions could be found; the cerebral vessels showed no changes. The cortex was of average pattern. No differences of size and shape could be found between the motor areas of the two hemispheres.

Brain (weight as a whole)	1,295 gm.
Right hemisphere	560 "
Left hemisphere	565 "
Cerebellum, pons and medulla	150 "

The upper end of the central fissure on either hemisphere ran into the mesial, and both sulci were of about normal depth and length. The superior genua were easily found on both sides. The inferior genua were fairly well marked. The great annectant gyrus was present on either side. There was no constant difference in the thickness of the

cerebral cortex, between the corresponding areas of the leg, arm and face of either side (all areas varying from 2.5 mm. to 3 mm. in thickness). The crura cerebri and the cerebellar hemispheres were of equal size on both sides.

The spinal column was normal. The whole spinal cord appeared natural except the right side of the cervical region where the meninges were thickened, very dense and tough and adherent to the cord substance over the region of the fifth, sixth, seventh and eighth cervical and the first dorsal segments. These thickened meninges extended slightly to the left of the median line on the anterior aspect of the cord. The thickening and adherence was most marked in the region of the seventh cervical roots and gradually decreased above and more rapidly disappeared below that level. In this process the anterior roots have suffered most and they were reduced in length to a varying extent and were entirely obliterated at the level of the seventh cervical root on the right side. The posterior roots were shortened and small. The right anterior horn zone was flattened and specially so at the level of the seventh cervical, thus making the right half of the cord much smaller in size. The anterior and posterior root bundles of the left side appeared natural.

The posterior cervical ganglia of the fourth, fifth and seventh cervical and the second dorsal roots showed no change on either side from the normal, except that the seventh cervical on the right side was reduced in size.

The brachial plexus of the left side appeared normal in size and in origin. The roots of the fifth, sixth, seventh and eighth cervical on the right side were much smaller than natural, and were reduced to fibrous cords which were impossible of good dissection, owing to the abundance of tough fibrous tissue suspending some fat in its integument. The eighth cervical root was larger than the fifth, sixth or seventh, while no difference could be noted between these latter three. The right plexus was much smaller than the left. There was no difference in size between the median and the ulnar nerves from the forearm of either side. Unfortunately the muscle tissue removed for examination of the muscle spindles and the cervical sympathetic ganglia were lost.

Technique.—The brain after removal was placed into 5 per cent. formalin for forty-eight hours, then the motor cortex on either side was divided into three areas according to the plan adopted by Campbell [5] in his investigations of the cortex in amyotrophic lateral sclerosis. The leg (or upper motor) area consisting of the precentral gyrus on the

mesial surface, with the external convex surface down to the level of the superior genu; that for the arm (or middle motor) area being that part of the precentral convolution between the superior and the inferior genua. The whole of the middle motor area of the left side was sectioned, also nearly all the superior motor area. Specimens were removed at different levels of all areas and serial sections examined. The cortex was stained by the Nissl, polychrome blue and Van Gieson methods for cells; by the Ranke, Heidenhain and Cajal methods for neuroglia; by Scharlach R and Sudan III for fat; by Bielchowsky's



FIG. 1.

Photomicrograph showing fibrosis in the anterior median fissure and destruction of the right anterior horn of grey matter at the level of the seventh cervical segment. (Ranke, Victorian blue stain.)

method for neurofibrils; and by the Weigert-Pal method for the cortical fibre systems. The spinal cord was kept in 5 per cent. formalin solution for a week and then all levels from the second cervical to the third sacral segments were examined by the Nissl and Weigert-Pal methods; and sections at various levels were stained by the Ranke, Cajal and Bielchowsky methods and by Scharlach R. The fourth, fifth, seventh cervical and the second dorsal posterior root ganglia were stained by Weigert-Pal and then the Nissl or Van Gieson method used

as a counter-stain. The brachial plexuses were cut transversely at the point where the posterior roots of the upper, middle and lower cords unite to form the musculo-spiral nerve, and, with the median and ulnar nerves of each side, were stained by the Weigert-Pal method.

Histological changes at the site of the lesion.—Microscopic sections show that the thickness of the meninges (to which reference has already been made) is due to the formation of firm and densely organized fibrous tissue, which is firmly adherent to the cord at the levels of the lesion, but specially so at the level of the seventh cervical segment. This superficial fibrosis extends even on to the anterior part of the left half of the cord at the level of the sixth, seventh, and eighth cervical roots. The local lesion first becomes noticeable at the level of the fifth cervical segment and is last seen on the surface of the cord at the level of the first dorsal. The maximum cord injury exists at the level of the seventh cervical root on the right side and in the anterior horn area a von Gudden's nerve evulsion was practically produced at the time of the trauma. Nearly all the structures lying in front of the anterior horn of grey matter have been involved in this sclerotic patch, and what still remains of the anterior horn of grey matter lies upon the antero-lateral surface of the cord. In this change not only has the right side been affected; but the grey matter on the left side is seen to be distorted and shrunken, especially at the level of the seventh cervical segment (figs. 1 and 2). The anterior median fissure is filled up with dense fibrous tissue adherent to both mesial surfaces. There is no neuroglia cell proliferation to be seen in any of these areas of fibrosis, or in the white or grey matter, by either the Ranke or Cajal methods. The only glia proliferation present is in the postero-mesial column (which I have regarded as a change not dependent in any way on the obstetrical trauma because of its equal existence above, below, and at the level of the lesion) and to a slight degree in the direct pyramidal tracts. All methods used show an absence of neuroglia cells except in these two locations. The Nissl-staining characteristics of the cells and their number are dealt with under special paragraphs. The Bielchowsky fibril method shows no neurofibrils in the cells of the right sides of the cord between the fifth cervical and the first dorsal levels. The cells show no fatty change whatever by Scharlach R.

Cervical 5: The general outline of the cord on transverse section is slightly changed, the right side being somewhat smaller than the left. Both anterior horns of grey matter are distorted. The anterior horn cells are reduced in number and show varying stages of degeneration,

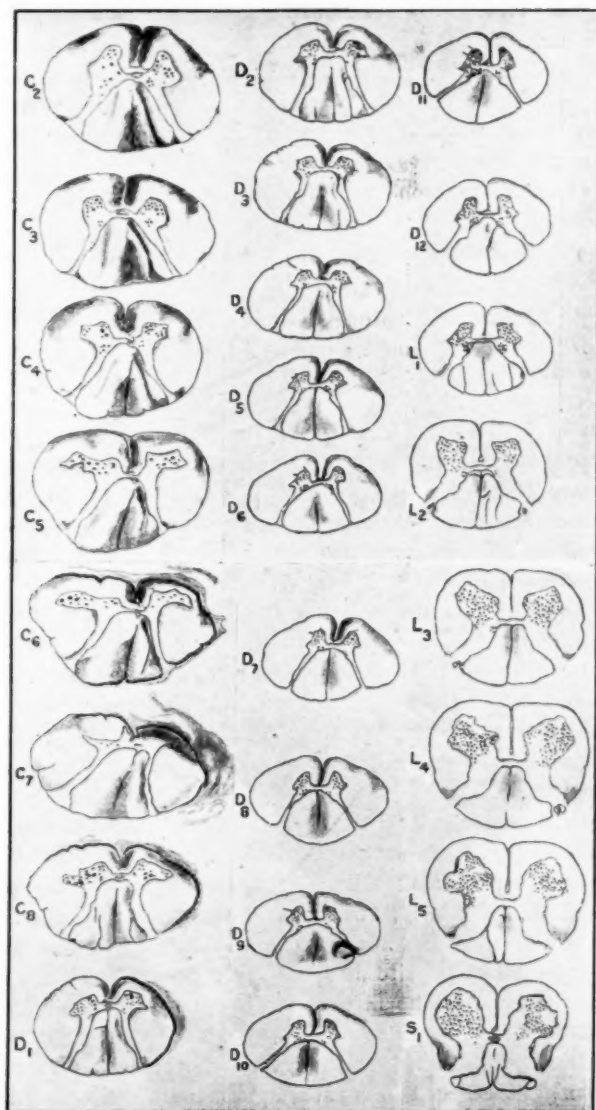


FIG. 2.

Drawing of all the levels of the cord, showing degeneration in the shaded areas (done with the Edinger projection apparatus). Approximate number and shape of the anterior horn cells shown, which were drawn in later at a magnification of 48. (Weigert-Pal.)

as evidenced by differences in size and shape, a complete absence, or a marked eccentricity of their nuclei and various stages of loss of basophilic substance, even to the condition where the protoplasm takes the basic stain evenly and intensely throughout. The cell processes are broken off in many cases. These changes are much more marked and the cells less numerous on the right side.

Cervical 6: All conditions outlined for the level above are seen here, but to a more marked degree. The meninges are more dense, thickened and adherent. The changes in the anterior horn cells are more evident and the cells on the right side have almost disappeared, being reduced to small darkly and evenly stained cell-remains; some having a small, dark eccentrically placed nucleus. The changes on the left side are also very great but still not as noticeable as those on the right. (See Anterior horn cells, fig. 3.)

Cervical 7: This is the level of the maximum change. The right side of the cord is small and flattened anteriorly. The fibrosis is marked and infiltrates the peripheral part of the cord for nearly its whole circumference (fig. 4). The anterior horn zone is so involved in the sclerosis that it lies bare upon the antero-lateral surface of the cord. The grey matter of both sides is very distorted and the cells are entirely absent on the right side and only a few darkly stained elongated forms remain on the left.

Cervical 8: The cord commences to regain a more natural shape. The meningeal fibrosis becomes less marked. The grey matter more closely approaches the normal in size and in shape. The cells are still reduced in number and marked changes are still present, but much more so on the right side.

Dorsal 1: From this level downwards improvement is marked and rapid. The cord regains a normal outline. The peripheral fibrosis is fast disappearing at this level. The anterior horn cells resemble the normal much more closely, but are still reduced in number. Three small cells are seen in the zone of Clarke's column at this level.

Cell changes above the site of the lesion: The cells of the anterior horns above the level of the fifth cervical segment show slight general changes in some areas, but nothing to any marked degree. The nuclei are concentrically placed in the majority of them and there is no chromatolysis. Their numbers are approximately shown in fig. 2. These cells do not take a fat stain.

Cell changes below the site of the lesion: The cells in the anterior horn zone in the dorsal cord are reduced in size and show some general

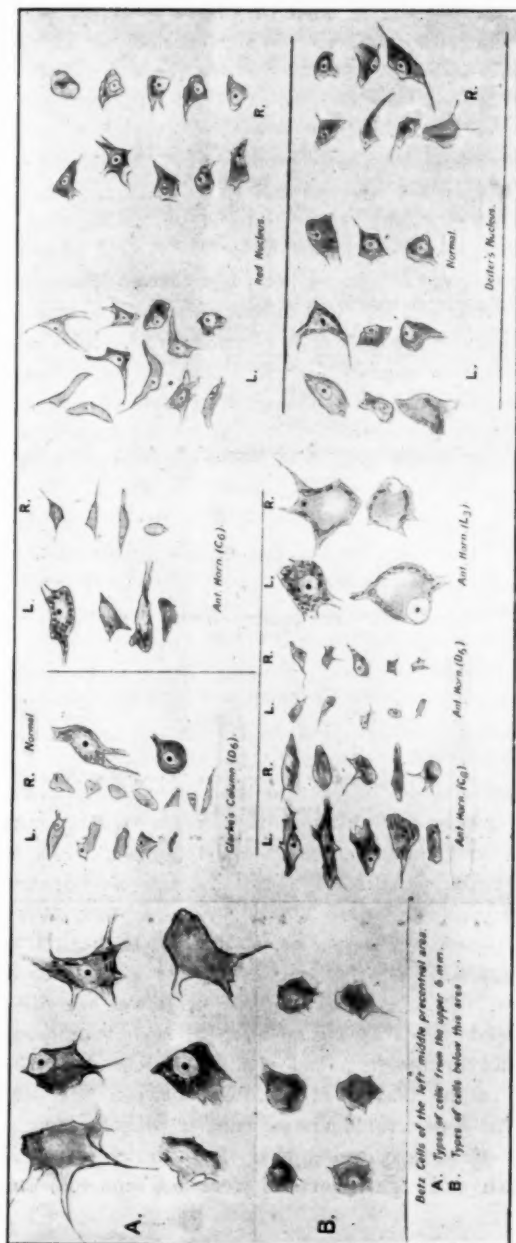


FIG. 3.
 Camera lucida drawings of cells from different areas. (Nissl.)

changes in chromatolysis. The cells of Clarke's column show great destruction, as evidenced by reduction in size, nucleolysis, chromatolysis and loss of cell processes. The changes are more marked upon the right side (fig. 3). These cells show slight fatty changes, especially on the left side. The cells of the lumbar enlargement show well-marked changes, especially on the right side at the level of the second, third and fourth segments, where they are reduced in number and show nucleolysis, eccentricity of nucleus, and chromatolysis to varying degrees. These changes no doubt have to do with the clinical phenomena in the right leg which have developed in recent years. These cells show slight staining by Scharlach R. Bielchowsky's method shows a reduced number of neurofibrils in the cells of the lumbar cord. The cells of the sacral cord are normal in number, size, and staining properties.

Descending tract changes below the seventh cervical root: Degeneration may be traced in the anterior pyramidal tract area down to the level of the eleventh dorsal segment. This degeneration is slightly more marked upon the right than upon the left side. Descending antero-lateral fibres (probably vestibulo-spinal fibres) may be traced, on the right side, down to the level of the second lumbar root. A slight antero-lateral degeneration is seen as low as the third dorsal on the left side. The location of these changes may be seen in figs. 2 and 4. A small group of fibres may be followed in the area of Schultz's comma tract as low down as the fourth dorsal root. There is no degeneration in the crossed pyramidal tract of either side except in the lower lumbar and sacral cord where there is slight change in the posterior root zone extending forward into the pyramidal tract area.

Ascending tract changes above the seventh cervical root: There is a well-marked antero-lateral ascending degeneration on the right side of the cord, and the same condition is present, but to a less degree, on the left side. These degenerated tracts may be traced into the medulla, and a well-marked bilateral degeneration may be seen in the superior cerebellar peduncles, especially that part of them adjoining the lingulæ. The inferior cerebellar peduncles show no degenerated fibres. At the entry of the posterior seventh cervical root a fibrous band takes origin, and in its ascent gradually tends towards the median line, and is last seen at the level of the second cervical segment in the posterior columns, between the lateral and mesial tracts. This degenerated fibrous band is without neuroglia cells, and is especially interesting, seeing that its posterior root ganglion is the only one (sixth and eighth cervical were not removed) that shows



FIG. 4.

Photomicrographs of the third and seventh cervical, with the third dorsal and the fourth lumbar. (Weigert-Pal.)

degenerated fibres in it ; and its cells (posterior root ganglion) are greatly reduced in number. No fibrous band can be found in the sensory tract above the posterior column nuclei. The central tract of the fillet shows a slight diffuse change. The degeneration in the postero-mesial tract has not been considered in detail, as it has no apparent connexion with the injury described. It exists far below the lesion, and, except for the additional fibrous band on the right side and a slight degree of change (apparently originating from the fifth and sixth posterior roots) in the left side, there is very little to be described in these sensory columns.

The direct pyramidal tract shows a well-circumscribed degeneration as high as the uppermost part of the cord. Unfortunately, the decussation of the pyramidal tracts was destroyed in removing the cord, but the sections of the medulla, and the pons and capsules strangely show very slight, if any, signs of degenerated fibres in the cortico-spinal system. However, the right pyramid of the medulla is smaller than the left. There is no difference in the amount of glia tissue, as shown by the Ranke method, between the pyramidal tract areas of either side.

Changes in the brachial plexus and the posterior root ganglia: The posterior ganglia of both sides of the fourth, fifth, seventh, cervical and the second dorsal roots show no changes in the number of cells, staining characteristics, or fibres ; except the seventh cervical of the right side, which shows a decided reduction in the number of cells, and degenerated fibres are seen in the ganglion. The right brachial plexus is smaller, and sections show more fibrous tissue than the left. The whole of the right plexus shows a diminution in the number of nerve-fibres, and great variability in their size and depth of staining. The distribution of this degeneration is best shown by the photograph (figs. 5 and 6). The fibres in the left plexus show slight changes, especially those from the fifth, sixth and seventh cervical roots. The right and left ulnar and median nerve-bundles show no difference in the amount of perineurium or epineurium, but there is great variability in the depth of staining, and in the number and size of the individual nerve-fibrils.

Deiters's nucleus: The cells of this nucleus are less numerous on the right side than on the left. They are smaller and show marked chromatolysis, eccentricity of nucleus, or a complete nucleolysis. Some of the cells of the left side show changes, but not to the same degree as the right. Ranke's method fails to show any difference in the amount of glia between the two sides (fig. 3).

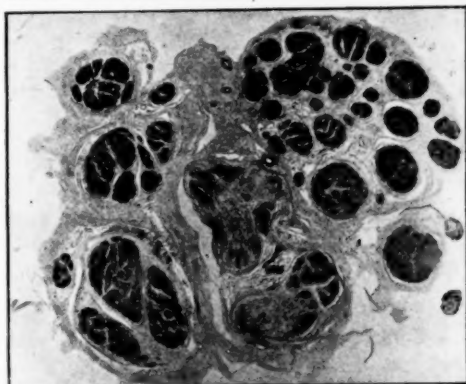
FIG. 5.

Transverse section through
cords of the left brachial
plexus. (Photomicrograph of
Weigert-Pal stained section.)

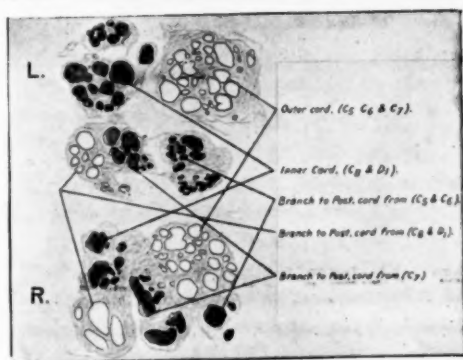


FIG. 6.

Transverse section through
cords of the right brachial
plexus. (Photomicrograph of
Weigert-Pal stained section.)



Key to figs. 5 and 6.



The red nucleus: The cells of this nucleus on the left side show more change than upon the right. The cells of the left nucleus are more elongated, their nuclei more eccentric, and the whole cell stains uniformly in intensity in many cases. No increase in neuroglia can be found on the left side (fig. 3).

The arcuate nuclei: The cells of both these nuclei are all very degenerated, showing total nucleolysis, and in many cases the cells are reduced to skeletal remains.

The cerebral arteries: The anterior, middle and posterior cerebral arteries on section show no pathological changes in any of their coats.

The cerebellum: The lobes of the cerebellum are equal in size and in general outline. The cells of Purkinje show some general change, as irregularity of outline, fracture of some of the processes, and a slight impairment in uniformity of staining. The changes are not at all confined to one side. The granular layer appears normal on both sides. There is no proliferation of glia in cerebellum, as shown by the Ranke and Cajal methods.

The Cerebrum.—The left upper precentral area: The lamination of the cerebral cortex in this area is normal, and the cells of the different layers, although slightly reduced in numbers, show no marked changes until the giant cells of Betz are reached. These cells are found only in the anterior wall of the central sulci on the external surface of the brain, but on the mesial surface they extend well forward on to the precentral gyrus. The majority of the Betz cells show various stages of degeneration. Their number is about normal. Some of the cell processes are broken off. There are various stages of perinuclear chromatolysis present. The nuclei are eccentric or absent, and the cells in a few cases are reduced to uniformly staining masses of protoplasm. Many of the cells show considerable alteration in shape, and in the periphery of some cells may be seen numerous dust-like particles, quite different in appearance from the normal basophilic granules. The majority of the cells of the precentral gyrus on the mesial surface are more globose in shape than those on the external surface, closely resembling the degenerative changes found in the right anterior cornu of the second, third and fourth levels of the lumbar cord. The Bielchowsky method shows a great reduction of the intra- and extra-cellular neurofibrils.

The cells of the intermediate precentral area are numerous, of normal lamination, and show no marked changes except that the large pyramidal layer shows slight degrees of degeneration.

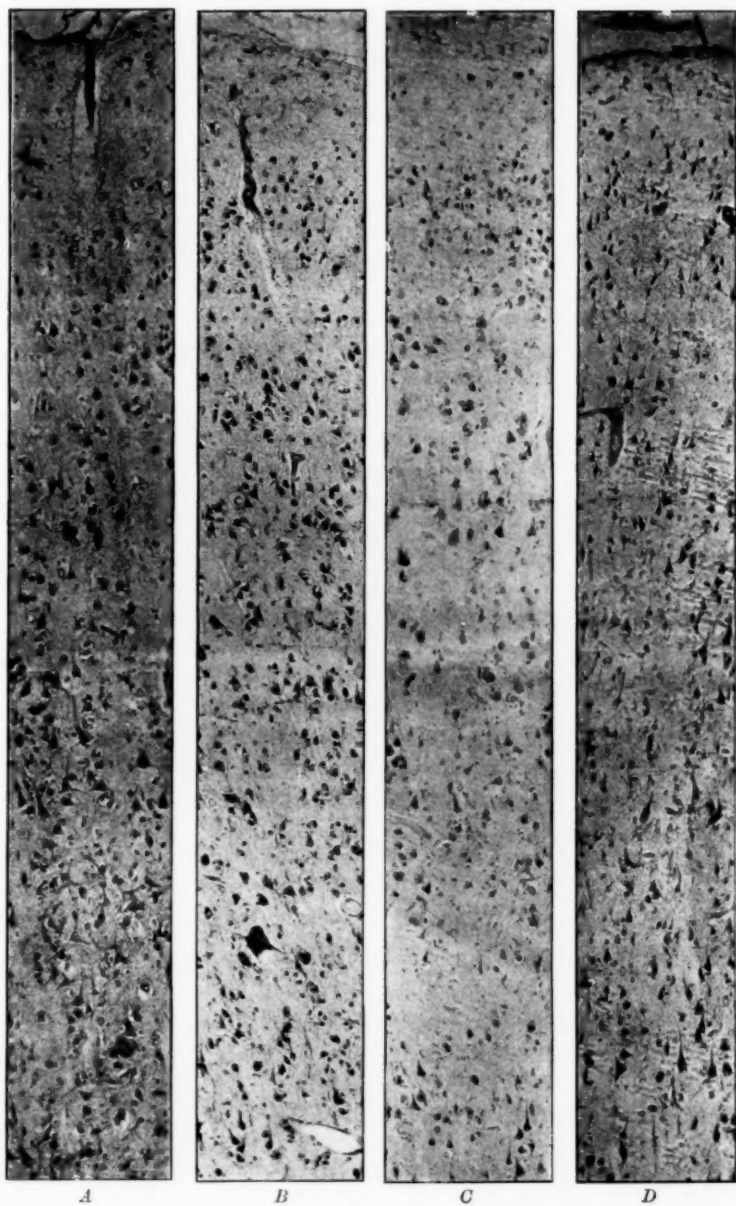


FIG. 7.

Photomicrographs of *A*, left mid-precentral area. *B*, right mid-precentral area. *C*, left intermediate precentral area. *D*, right intermediate precentral area. (Nissl, $\times 150$.)

The post-central cortex shows no marked changes, either in lamination, number of cells, or in their staining properties.

The right upper precentral area: The cells and their lamination in this area present similar appearances to those observed in the corresponding area of the left side, but the Betz cells do not show the same degree of change. The intra- and extra-cellular neurofibrils are more numerous than on the left side.

The cells of the intermediate precentral area are about normal in number, shape and size. The cell lamination of the cortex in this area is of normal appearance.

The cells of the post-central region show no special changes.

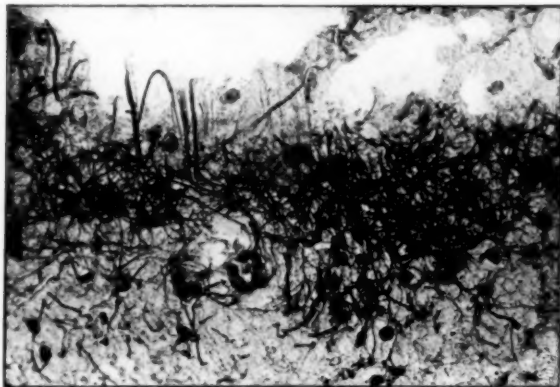


FIG. 8.

Photomicrograph showing sub-pial felting due to glia proliferation in the tangential layer of the left middle precentral area. (Ranke, $\times 350$.)

The left middle precentral area: The cells in this area (and more especially those of the superficial pyramidal layers) show more general changes, but no reduction in number when compared with the cells of the corresponding area of the opposite side (fig. 7, A). The degenerative changes are especially marked in the Betz cells. These latter cells in about the upper 6 mm. of the area (i.e., the 6 mm. immediately below the superior genu) are of the types represented in the first two upper rows of fig. 3. Here is seen loss of cell processes, eccentricity or absence of nucleus, and chromatolysis. There is scarcely one cell in this area that might be called normal. Below this, over an area

of about 4 to 6 mm., the giant cells are greatly reduced in number, and are small, darkly stained bodies, devoid of processes, and without any trace of nucleus, nucleolus, or basophilic granules (fig. 3). Over the remainder of the area the Betz cells have almost disappeared, only occasionally a cell of the type last mentioned may be found. The cells of the polymorphous layer show slight general changes. The Bielchowsky method shows few neurofibrils in this area, and the giant cells stain very badly. Scharlach R does not stain any of the cells of this area. The neuroglial changes here are very definite.

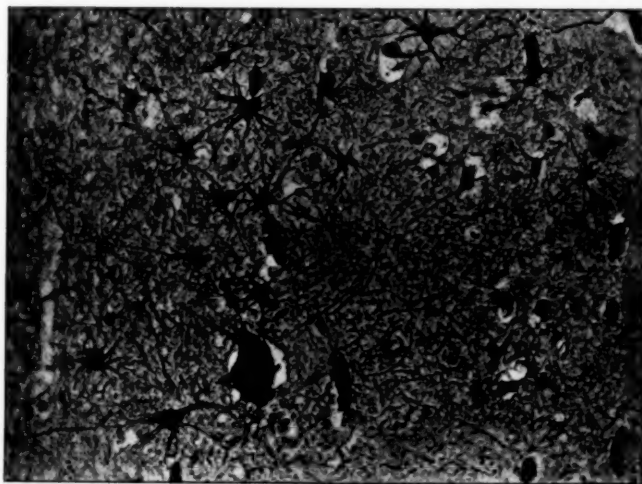


FIG. 9.

Photomicrograph showing proliferation of glia cells around a small vessel in the polymorphous layer of the left middle precentral area. (Cajal, $\times 400$.)

Whilst there are some changes in the corresponding area of the right hemisphere, the densest neuroglial proliferation is seen in the left precentral area, and only here are the changes definite and constant. The proliferation of neuroglia in the tangential layer is very evident, as can be seen as a dense sub-pial felting by reference to fig. 8. There is no demonstrable proliferation of glia below the molecular layer until the Betz cell layer is reached. Below this area, in the polymorphous layer and in the cortico-medullary area, the glia tissue is much proliferated (*see* fig. 9, showing proliferation around a vessel).

Hence the glia is laminated in the deeper layers, and especially so in the polymorphous layer. This proliferation of glia is very similar in distribution to that shown by Dr. Mott in "Amyotrophic Lateral Sclerosis" [15], where he described the deeper layers of the motor cortex alone involved in the gliosis.

The intermediate precentral area of the left middle motor cortex (see fig. 7, C) shows a very great general reduction in the number of cells, and especially so in the medium-sized and in the large superficial and deep pyramidal layers. These profound changes are found only in the intermediate precentral, are as outlined by Campbell [5], and do not extend forward on to the frontal convolutions. The cells of

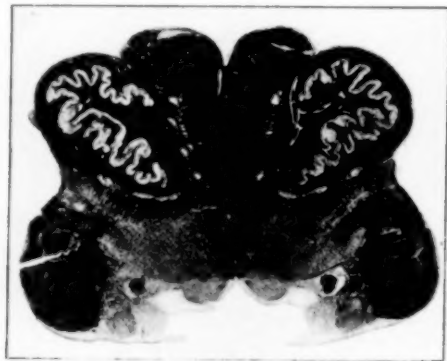


FIG. 10.

Photomicrograph of a transverse section through the middle of the olives.
(Weigert-Pal.)

the large superficial pyramidal layer show the greatest change, there being complete chromatolysis and very frequently nucleolysis. The cell processes are broken off, and in some cases the cells are reduced to skeletal remains. The most severe changes in this area of the cortex are seen in the large pyramidal layers. The internal large pyramidal layer shows cells in the late stages of degeneration.

The post-central area of the left middle cortex shows very little general change, and in no detail differs from the post-central cortex of other areas.

The fibre system of the left middle precentral area shows very general and decided changes when compared with the same area of the right hemisphere. The plexiform, supra-radiary, and radiary fibres

of the left side have almost totally disappeared. The fibre system of the right middle motor area presents a totally different appearance. The plexiform layer is the only one that shows any degree of change in this area, and here the fibres are delicate and scarce. The supra-radiary and radiary fibres are much nearer to the normal both as regards appearance and numbers. These changes in the cortical fibre system are relatively more marked than the cell changes.

The corpus callosum shows some scattered areas of secondary sclerosis, especially in its middle one-third. The genu and the splenium cut and stained in the same celloidin block show no such degenerative change.

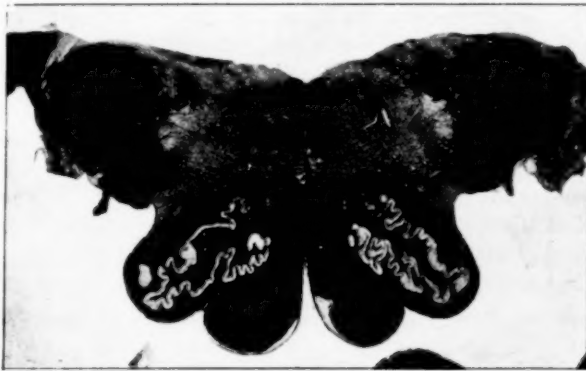


FIG. 11.

Photomicrograph of transverse section through the uppermost parts of the olives. (Weigert-Pal.)

The right middle precentral area: The lamination of this area is normal, but the cells show some general change although not to the same degree as the left side (fig. 7, B). The Betz cells vary in appearance, but the types are different from those on the opposite side, in that the chromatolysis is not as marked and there is not such complete nucleolysis. The number of Betz cells is somewhat below the average. The Bielchowsky method shows a reduced number of intra- and extracellular neurofibrils as compared with the normal, but a great increase over its fellow of the opposite side. The Ranke method shows no proliferation of glia in the tangential layer, nor is there the same proliferation of glia in the deep layers of the precentral area.

The intermediate precentral area is well laminated. The cells here

are much more numerous. Their cortical processes point perpendicularly to the molecular layer, and there is no degree of fragmentation of the cells themselves. This condition is maintained generally throughout the area, and stands out in marked contrast with the corresponding area of the left hemisphere (fig. 7, D).

The post-central area of this side shows no distinctive changes from the same location in the left post-central cortex.

The right and left lower precentral areas: The changes in the face areas of both hemispheres will be described together as the conditions found coincide. The number of cells and their lamination show no marked changes from the normal. The giant cells are smaller than those in the other areas, and do not confine themselves only to the anterior surface of the central sulcus, but extend forward on to the external surface of the ascending frontal convolution. They are very much less numerous than in other areas, and at the lower end of the sulcus none can be found. The chief changes in the Betz cells are some chromatolysis and eccentricity of nucleus with no nucleolysis, but there is a noticeable absence of the other extensive changes which were described in the left arm and leg areas. There is no proliferation of glia to be found in the plexiform or deep layers on either side.

The intermediate precentral and the post-central areas of both sides show no special changes.

LITERATURE.

With the exception of papers describing the ordinary type of brachial plexus root lesions, the literature relating to the pathological changes found in obstetrical paralysis is very scanty. Numerous cases have been reported from the clinical and surgical aspects, with occasionally a short outline of the pathological condition present, which is usually in the fifth cervical root near its junction with the sixth. But more roots than the fifth are often involved. Occasional mention is made of injury to the cord, but with no great detail. The present case is therefore of more than usual interest as the local and general changes of the cerebrospinal system have been described.

The more severe cases reported usually have a history of difficult labour and asphyxia. Huet [12] describes a case with version and double upper arm paralysis, probably from extension of the arms over the head. Babonneix [1], Raymond [20], Thomas [22], and Broca [3], record cases where resuscitation was especially difficult. This may

be the result of interference with the neighbouring nuclei of the phrenic nerve from hæmorrhage or trauma of the cord, or it may be from pressure of the phrenic nerve itself, or it may perhaps be explained by the shock of the injury, especially when much hæmorrhage is present, or it again may be due to exhaustion from the difficult prolonged labour alone. One or all of these conditions may help to explain the asphyxia found in this type of case.

The aetiology of this lesion is generally ascribed to a pathological increase in the distance between the tip of the shoulder and the head in delivery. Bailey [2] fixes thirty degrees as the limit for the axis of the head to be drawn laterally away from the long axis of the body without danger of the cords being stretched severely or ruptured. Carter [6] mentions stretching or rupture of the upper roots of the brachial plexus during the process of delivery as the only cause of this condition. There are various other views, such as pressure with the forceps, pressure on the first rib or over the transverse process of the vertebræ, and pressure by the scapula.

I have exposed by careful dissection four brachial plexuses in newly born infants, and have found that if forcible traction is exerted in a downward direction the fifth and sixth cervical roots are most stretched, but if the traction is exerted in a line at right angles to the mid-line of the body, the middle cords of the roots of the brachial are the first to become taut. If great traction is exerted on the arm in a line at right angles to the body I have produced in the cord an evulsion from the cord substance of the anterior and the posterior nerve-roots, and this is most marked in the seventh and eighth cervical levels. The peripheral part of the nerve-roots is materially stretched, but I could find no microscopic evidences of fragmentation of the fibres. Traction in this line may explain the condition and the roots involved in this case. But as can be readily understood, traction in this line (right angles to the body) does not seem, from a physiological point of view, to be of any assistance in labour.

Clark, Taylor, and Prout [7], in their exhaustive paper report only one case of rupture of all the roots, and the only pathological lesions mentioned are rupture of the perineural sheath with coincident hæmorrhage and laceration of the nerve-fibrils of the brachial radicals. They comment on the slight sensory changes found in these cases, and upon the resultant traumatic neuritis sometimes seen clinically. Prout [19], in his article upon the pathology, only mentions again the presence of rupture, hæmorrhage and laceration of the nerve-bundles. Weil [24],

from the clinical standpoint, describes three types—viz., the upper arm, the lower arm, and the mixed types—and he describes a case of lesion of the entire plexus. Warrington and Jones [23] state that sensory changes are especially liable to be found in cases where the lower radicals of the plexus are torn, and they place the lesion as intra-, inter-, or extra-vertebral. Oppenheim, in his text-book on Nervous Diseases, states that Bruns believes that the effect of traction often extends into the cord itself, and that this accounts for some of the unfavourable cases. Oppenheim, however, chiefly considers peripheral root lesions. Burr [4] suggests the cord as the site of the lesion much more commonly than is generally accepted. Gallavardin [8] reports a case with very slight motor lesions, but marked sensory changes over the whole of the upper limb. Raymond's [20] case had double upper arm paralysis and a spastic gait, which he concludes was due to hæmatomyelia and interference with the pyramidal tracts. Neurath [17] speaks of cord lesions in obstetrical paralysis, and found multiple miliary hæmorrhage in the lumbar cord in a case dying shortly after birth. Jolly [13] reports a case of bilateral paralysis of the lower arm type specially involving the seventh cervical root. Thomas [22] mentions a case with rupture of the cord and meninges between the sixth and seventh cervical roots in a footling presentation. Gott [9] reports three cases with autopsies showing hæmorrhages into the lumbar cord in foot presentations. These cases had sensory changes. Gravellova [10] states that obstetrical lesions may involve the brachial plexus or the cord, and he reports a case followed by Little's syndrome. Philippe and Cestan [18] report a very interesting case with coincident spastic gait, which they, however, show to be due to a cortical lesion and not to interference with the pyramidal tracts. The child died of scarlet fever at the age of 6, and they found a brachial plexus lesion very similar to that described in this case with a cervical pachymeningitis, and the posterior root fibres were more involved than the anterior. They describe degeneration in the antero-lateral tract of the cord descending to the tenth dorsal root; also pyramidal tract and posterior column degeneration. Although the sensory root fasciculi were much damaged, they described no sensory changes. They found no signs of hæmatomyelia, and described a true cicatricial organization around the bundles of the brachial plexus, and a great reduction in the number of nerve-fibrils. The chief lesion was at the level of the eighth cervical root. There was no oculo-pupillary disturbance.

The case which forms the subject of this paper presents several

points of interest. Unfortunately I have been unable to obtain a detailed account of the clinical and electrical examination of the upper and lower limbs of the right side, but in the case of the latter the history clearly shows that the paresis is of comparatively very recent development.

SUMMARY.

(1) The seventh cervical root, which is the site of greatest trauma in this case, is not the usual point of maximum lesion as described in the great majority of cases of obstetrical paralysis.

(2) The usual site of the lesion is the nerve-trunk itself, but in this case there was superadded a more grave injury of the cord amounting to a Gudden's evulsion at the level of the seventh cervical root, and diminishing in severity above and below this point.

(3) Although the left arm was not involved at labour, yet histological examination shows that there was great cell destruction on that side in the cord, especially at the seventh cervical level.

(4) The sensory system in this case suffered least damage. The fibrotic band which originates at the seventh cervical root of the right side is found to disappear at the nuclei of the posterior columns (i.e., it is not seen in the medulla or pons).

(5) The local fibrosis can be best explained by the invasion of an organized fibrous tissue, resulting from the trauma, into the injured areas of the cord. The almost complete absence of glia cells locally is very definite and is rather difficult to explain, seeing that in this case much more than the meninges and peripheral roots were injured.

(6) It is difficult to explain the well-marked changes in the direct pyramidal tracts in the cord and the absence of degeneration (to any corresponding degree) in the medulla or pons (compare figs. 4, 10, and 11). The explanation may possibly be found in the fact that the pyramidal tracts are not myelinated at birth, and the sclerosis in the area of the direct pyramidal tracts in the spinal cord may be an irritation phenomenon of a local nature as the results of the trauma, but the axons above the local field of injury corresponding to their systems not being myelinated and consisting only of delicate protoplasmic strands, might conceivably disappear without leaving any appreciable tracts of sclerosis amidst the abundant myelinated fibres constituting the pyramids. On these grounds alone, however, it is difficult to explain why the degeneration in the area of the direct pyramidal tracts descends so far below the local traumatism. The above explanation may also apply to the absence of degeneration in the right crossed pyramidal

tracts; these being so deeply placed and not having suffered any local injury, the axons for the right upper limb have disappeared and leave no demonstrable remains. Or Kapper's work on Neurobiotaxis might suggest an explanation, in that the axons may not have been attracted to the anterior horn cells at the site of the trauma, owing to their great impairment of function or total destruction. Although there is a great difference between the size of the right and left crossed cortico-spinal tracts, yet up to very recent years this right crossed tract for the leg has functionated perfectly; and there is no evidence from the condition of the fibres below the lesion in the cervical area that the tract was implicated in the local process. This suggests that a physiologically functionating system of fibres is not invaded or strangled by glia or fibrous tissue in process of proliferation or cicatrization, which has likewise been shown experimentally in monkeys not to occur [16].

(7) The changes in Deiters's nuclei on either side indicate some involvement of the vestibulo-spinal system of fibres. This is especially well marked on the right side.

(8) The scarcity of cells and the degeneration in the red nucleus, especially on the left side, rather suggest that some interference with the right rubro-spinal tract has taken place which may perhaps be located in the region of the much injured anterior horn of grey matter at the level of cervical 7. These changes are in distinct contrast to the absence of changes in the cerebellar cortex.

(9) Unfortunately there is some general change in the giant cells of the cerebral motor cortex, but examination of the left middle motor area in its middle and lower parts clearly shows the almost total destruction and disappearance of the Betz cells. Some of this cell degeneration closely resembles that described in cases of amputation recorded by Campbell [5]. This is especially striking in the small and darkly stained masses without processes or nuclei. I am unable to report the complete disappearance of all the Betz cells as Gordon Holmes and Page May [11] have described after 229 days in their experimental work on the localization of the motor areas. Sewell and Turnbull [21] found no marked reduction in the number of Betz cells, but a general degeneration of them fifty-six days after an accident causing a complete transverse lesion of the cord in the cervical region.

(10) The cell destruction of the intermediate precentral area of the middle motor cortex of the left side is seen throughout the area and is most striking. The magnitude of the changes in this area

would seem strongly to suggest that it has to deal pre-eminently with the motion of the upper limb. This area, and especially the large pyramidal cells, may be (as Brodmann suggests) merely the seat of the ideation of movement, or perhaps (combined with that function) it is the centre for the more delicate and skilled manipulations of the upper limb, leaving the more gross movements to the Betz cells.

(11) The post-central cortex has no local changes referable to any one particular area.

(12) The marked changes in the fibre system of the left middle precentral cortex strongly substantiate the importance of the degenerative phenomena described in the Betz cells of this area.

(13) The glial changes in the left middle precentral area are constant in two localities. In the tangential layer the sections show varying amounts of glia proliferation and a more constant change is seen in the deep layers of the cerebral cells where the glia tends to distinct lamination.

(14) The right leg atrophy I can in no way correlate satisfactorily with the changes described as due to the obstetrical trauma. The history is very definite as to the absence of any clinical phenomena in the leg until comparatively recently. It appears to be a primary degeneration of the cells in the anterior horn of grey matter in the lumbar enlargement of the cord, and associated with it a similar degeneration in the Betz cells in the left upper precentral area without any demonstrable degeneration in the right crossed pyramidal tract.

(15) It is highly improbable that excision of part of the nerve-trunk and anastomosis of the two ends as Kennedy [14] suggests and practises would be of any avail in obstetrical paralysis of the severity of this case, and almost assuredly the operation would be followed by disappointing results. Fortunately cases of this malady are not frequently seen in such severe forms and in the same location as the one I have just described; but this case and a review of the literature suggests to one that in severe and persistent cases of paralysis resulting from obstetrical trauma, the probability is that the cord is injured much more frequently than is generally considered. The greater part of the literature relates to the clinical and surgical aspects of the condition, while that dealing with the pathological changes, in the majority of cases, only makes mention of laceration of the nerve-fibres and sheaths in their radicals without any consideration of the possibilities of medullary lesions of the cord.

In conclusion, I wish to thank Mr. Charles Geary for the photographs.

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DISCUSSION.

Dr. S. A. K. WILSON wished to ask Dr. Boyer if he could throw any light on one or two points which had suggested themselves to him in connexion with the well worked-out case that he had read. One was struck with the apparent integrity of the pyramidal tracts in the medulla, and presumably also in the pons, and, he supposed, in the internal capsule also. At the same time, according to Dr. Boyer, there was a gross loss of fibres in the so-called motor area and in the intermediate precentral area. In addition, there was a marked loss of cells in these areas, apart from the cells which were simply deteriorated. One, therefore, naturally wondered whether there were fibres in the pyramidal tracts, in the medulla or lower down, which were not of cortical origin. Dr. Boyer's case seemed to support the view of Marie that in the pyramids in the medulla were "pyramidal fibres" not derived from the cortex. Dr. Wilson asked if there was any part of the pyramidal system which Dr. Boyer had examined, from the cortex downwards, which showed an alteration in its dimensions as the result of that obvious cortical disease. He also asked if there was any lesion, clinically or otherwise, of the cervical sympathetic on the affected side of central origin.

Dr. F. E. BATTEN said that the rarity of the case lay in the fact that there was an injury of the brachial plexus in association with injury of the cord. Most of the cases which had been recorded were either cases in which there had been injury to the brachial plexus or there had been at birth an injury to the spinal cord. It was rare to get the associated conditions, and it was impossible to diagnose the associated conditions clinically. Dr. Boyer had referred to the literature as regards injury to the brachial plexus, but he had neglected the literature on the occurrence of hæmorrhage into the spinal cord in young children. It was of fairly common occurrence, as Dr. Herbert Spencer had pointed out, in infants who died at the time of, or immediately after, birth. The degeneration in the direct pyramidal tract above the lesion to which Dr. Boyer had called attention was difficult to account for. He asked if Dr. Boyer had cut serial sections above the lesion. He thought there must be some localized lesion below the decussation of the pyramids which had caused the degeneration in the direct pyramidal tract, because there was little or no degeneration in the crossed pyramidal tract, as evidenced by the sections which the author had shown. There was another point on which he did not feel certain, namely, that Dr. Boyer said that the ulnar and median nerves were much the same on the right side as on the left. The lesion of the cord was at the sixth and seventh cervical roots, and one would have expected that the median and ulnar nerves would have been smaller on the affected side than on the other. He asked Dr. Boyer if that was the case.

The PRESIDENT (Dr. F. W. Mott, F.R.S.) said he was particularly interested in the fact of the changes in the intermediate precentral area, which was of importance in connexion with skilled movements. Not long ago he was engaged with Professor Sherrington and Dr. Schuster in demonstrating that in the gibbon, which was an extraordinarily active animal with its arms, there was an enormously large intermediate precentral area. It was not until one got to the anthropoid apes that the direct tract was found. He did not know if there was a direct connexion between the degeneration of the precentral area in this case and the marked degeneration of the direct tract.

Dr. BOYER, in reply, said he was sorry if he had given a wrong idea to Dr. Batten. The ulnar and median nerves appeared to be of the same size, but microscopically they showed great differences. The epineurium and perineurium were very much proliferated on the right side, the fibres were much less numerous, they stained poorly and varied very much in size. With regard to the cases reported in children, he only mentioned these in order to try and convince his hearers that the condition in the cord was more common than it was generally supposed to be, especially in the average medical or surgical clinic. He did not think it was supposed that brachial plexus disease was often a cord lesion. Regarding Dr. Wilson's suggestion concerning the pyramidal tracts, he could not suggest why they should be lost on the left side. He examined the internal capsules, and, while there was some

diffuse degeneration there, he could not find it in the pons, though he cut several levels of the latter. He also cut nearly all the medulla, but could not find it there. He satisfied himself and Dr. Mott that they were not degenerated fibres, and that their appearance was due to error in technique, or in the staining. With regard to the sympathetic, that was lost after removal. The pupils did not show anything. He did not himself examine the case clinically. Unfortunately the decussation of the pyramids was totally destroyed in removing the brain and cord.

Neurological Section.

December 14, 1911.

Dr. F. W. MOTT, F.R.S., President of the Section, in the Chair.

Case of Myotonus.

By A. E. GARROD, M.D., F.R.S.

E. P., AGED 18. He was admitted to St. Bartholomew's Hospital on October 24, 1911, complaining of uncontrolled muscular contractions.

Past history: Beyond measles and chicken-pox he has had no illnesses. He has always been small. When aged 14 he was 4 ft. 6 in. in height; he is now 4 ft. 7½ in. Two years ago he began to have cramps, at first in his toes and legs. These cramps have spread till almost all parts of his body have become liable to muscular contractions. Sometimes he bites his tongue. At his worst, about two months ago, he sometimes had as many as twenty attacks in a day. Both tonus and clonus have been observed. The right side is somewhat the more affected. Cold is apt to produce an attack. The thyroid gland is somewhat enlarged, and the thyroid cartilage is smaller than usual. There is an almost complete absence of hair on the body. The terminal phalanges of the fingers are unusually short. The epiphyses of the long bones are not united. The sella turcica appears to be smaller than usual. His intelligence is good.

All his family are of small stature. One of his brothers began to grow after the age of 21.

DISCUSSION.

Dr. GARROD added that the spasms, which were very remarkable when he first appeared, were now very much in abeyance. At the time of his admission he would have a sudden attack of spasm, mainly affecting the masseter and temporal muscles on the right side, and would double himself up, evidently in severe pain. In such attacks he would sometimes bite his tongue, but there was

no reason to think there was any epileptic element in the attacks. The tongue used to become fixed between his teeth, and until the spasm relaxed he could not release it; he was conscious all the time. Sudden movement or exposure to cold would bring on a much more widespread spasm. Some of the fibres of a muscle stood out as bands; sometimes there were clonic movements as well. The attacks did not show any particular symmetry. When the patient came into hospital the right temporal muscle stood out as a lump. Occasionally the abdominal muscles would contract, but the contractions had not been observed in the legs. The electrical reactions were reported by Dr. Lewis Jones to be particularly good to interrupted currents but not so good to the continuous. The boy came of a family of very small people; he had an infantile look and his hair had a wig-like appearance. The hair on his surface was entirely confined to the top of his head; there was none in the axillæ or in the pubes, but his penis, scrotum, and testicles were not ill-developed. His thyroid gland was decidedly plump, but his sella turcica was no larger than usual. Some forms of infantilism were said to be related to the condition of the pituitary gland, but the skiagram showed that that gland was not enlarged. Extract of pituitary gland was given at first. He had been having electrical baths and enjoyed them. The continuous warmth and comfort in the hospital seemed to do him more good than anything.

Dr. F. E. BATTEN said he had seen the case at Queen Square Hospital at the end of September, and he was sure he had never seen a similar case. He looked up the subject, but could not find any description of a "paramyotonus multiplex" except that of Eulenberg in 1866, and his cases did not show a close relationship to the present case. Dr. Wilson had called his attention to a report by Schultze¹ on a case of localized muscle cramp with hypertrophy, which most nearly resembled this patient. Remak's article on spasm of muscles in the *Deutsche Klinik* contained nothing exactly corresponding to this case.

Three Cases of "Bilateral Athetosis."

By JAMES COLLIER, M.D.

Case I.—W. F., a clerk, aged 37. No history of any similar malady in the other members of his family. He enjoyed good health till his eighteenth year, when he first noticed difficulty in controlling the movements of his face, the movements concerned in speech, and the movements of his left hand. His symptoms have been slowly progressive ever since. Wasting of the muscles below the knees has been noticed several years. He is very intelligent. The striking features of

¹ *Deutsch. Zeitschr. f. Nervenheilk.*, Leipz., 1903, xxv, p. 1.

his malady are: (1) Remarkable spasm of the muscles of the face, jaw, tongue, &c., when he tries to speak or otherwise use these muscles; the spasm frequently causes dislocation of the jaw forwards, and the tongue is often bitten; his speech is difficult to understand, for he can neither close his glottis nor shut off his nasopharynx nor control his tongue and lips. (2) His left upper limb is practically useless to him on account of the spasm which the attempt to use it produces; spontaneous involuntary movements of a coarse, jerky nature, and also of an athetoid nature, are often present; the right upper limb is normal, and he writes well. (3) He walks stiffly, with the knees somewhat bent in; he has been wearing a support upon the left leg to prevent the spasm turning his foot on to its outer edge in walking. (4) There is marked general wasting of the muscles below the knees, but voluntary movement in all groups is fair, considering the size of the muscles. (5) There are no signs of involvement of the pyramidal tracts; the cranial nerves and special senses are normal; sensibility is normal; the sphincters and the reflexes are normal.

Case II.—F. G., aged 53. No history of any similar malady in the family. When about 7 years of age spontaneous involuntary movements of the hands were first noticed, and these have since spread to the other limbs. He was able to earn his living as a carpenter until the age of 45, when the movements had attained such a degree as to incapacitate him from any work. His condition has gradually become much worse in the last seven years. There is some overaction of the muscles of the face, tongue, &c., when he speaks, and his utterance is indistinct. There is spasm in all the muscles of the limbs when he tries to use them, and this is accompanied by coarse, jerky and athetoid uncontrollable movements. Spontaneous involuntary movements of the limbs may also be seen when no effort is being made. He walks stiffly, with the feet and knees inturned. There is some optic atrophy. The plantar reflex has been considered to be of the extensor type, but the constant spontaneous movements of the toes render the examination of this sign of doubtful value. There are no other signs of defect in the nervous system.

Case III.—A. G., aged 16. No history of familial disease. He was quite strong and healthy till the age of 8, when the present trouble came on gradually, but his mother says he has always talked much more slowly than her other children. It was first noticed that he was beginning to walk with the left heel drawn up, and six months

later the left leg was so incapacitated that he used a crutch on that side. He was sent to a hospital, where he was kept in bed for a fortnight, and at the end of that time he could not use either leg for walking. For the next three years he did not walk at all, but during the next year he became able to walk, and has since improved in this respect. The left hand began to be affected about a year after the legs, and the right hand was affected shortly afterwards. The face and tongue are slightly spastic, and there is spasm around the mouth on speaking. Speech is a little slow and clumsy. There is marked constant spasm in the forearm muscles, and there is flexor contracture of the fingers. The heads of both radii are displaced, presumably as the result of the spasm. Some of the intrinsic hand muscles seem to be hypertrophied. The forefinger and thumb of either hand are used to grasp objects, and the movements of the upper arm seem normal. There is constant spasm in the lower extremities, but the voluntary movements are fairly powerful. He can stand in a natural position, but directly he attempts to walk severe flexor spasm appears in both legs, but especially in the right, giving rise to a most peculiar gait. There are no signs of defect in the pyramidal tracts, and no other phenomena indicative of nervous disease are present.

The striking features of these three cases are the interference with volitional movements by spasm of the muscles and the occurrence of involuntary spontaneous movements, the post-natal onset, and the absence of any sign of defect in the pyramidal system.

Dr. COLLIER added that the cases were post-natal in onset, and were slowly progressive. This slow progression suggested a cell pathology. Involuntary movements and spasm had been described in connexion with disease of the lenticular nucleus, and possibly the seat of the trouble here might be the grey matter in the base of the brain.

A Case of Bilateral Involuntary Movements, Athetoid and Choreiform.

By T. GRAINGER STEWART, M.B.

J. S., MALE, aged 9½. Family history good. Personal history: Patient was a seven months' child; the labour was difficult, but nothing abnormal was noted. He was reared up with difficulty, being "bottle-fed." When ten months old he was taken to Great Ormond Street

Hospital, and was treated there as an out-patient for six months. The reason he was taken was because he did not attempt to use his hands or to kick about like other children. Patient was treated for rickets. He began to talk when $2\frac{1}{2}$ years old, and to use his hands when he was 3 years old. When 4 years of age the movements commenced. The onset was quite gradual, and they have increased steadily, but more rapidly, during the past six months. He has always been clean in his habits and has appeared to be quite intelligent. He first began to walk when he was between 7 and 8 years of age, but previous to this he had learned to use his right foot for writing and feeding himself.

Present state—*Mental*: Intelligent; can read. *Cranial nerves*: The pupils and reflexes normal, the ocular movements limited, some difficulty in maintaining fixation. Movements of the face, jaw, and tongue fairly continuous. The tongue is not protruded but is rolled about in the mouth. *Motor system*: There is more or less movement of the face and upper arms; the right upper extremity has movements of a choreiform character, sudden and irregular, affecting the proximal segments more than the distal, increased on voluntary movements. The arm is usually held extended from the shoulder. The movements of the left upper arm are, in appearance and character, more like athetosis. The fingers tend to be saddle-backed, and the movements are more marked in the distal segment than in the proximal. It is difficult to say whether there is any inco-ordination, as any voluntary action increases the movement. There is continual irregular movement in the trunk muscles. Lower extremities: Power and range of movements quite involuntary. Movements are practically continuous in both limbs, but the patient is able to perform the most delicate movements accurately; thus, he can write and feed himself with his right foot. *Gait*: The patient can walk alone, is extremely springy and jumpy; looks as if he is going to fall down, but does not do so. There is no muscular wasting and no spasticity; the limbs can be passively moved and hyperextended. Involuntary movements cease during sleep. Sensory system normal. *Reflexes*: Deep—arm, right and left absent; knee, right and left present; ankle, right and left present. Superficial—epigastric, right and left brisk; abdominal, right and left brisk; plantar, right and left flexor; occasionally a doubtful extensor. Sphincters normal.

DISCUSSION.

Dr. GRAINGER STEWART said that the symptoms in his case pointed to a lesion, or lesions, involving either the system which connects the dentate nucleus of the cerebellum via superior cerebellar peduncle with the red nucleus thalamus and cortex, the lenticulo-rubrospinal system, or the connexion between the corpus striatum and the subthalamic region. In his case there was no evidence of a pyramidal lesion or of any diplegic condition. The reflexes were normal, if anything the deep reflexes were diminished, the muscles were hypotonic, and there was absolutely no spasticity. In these cases of involuntary movements, either cases of athetosis, or of so-called post-hemiplegic chorea, the one point essential was that the pyramidal tract must not be severely injured. In cases of so-called post-hemiplegic movements in which hemiplegia had been present, the movements only commenced when the hemiplegia was recovered from; that is to say, when the pyramidal system was again beginning to functionate normally. It therefore appeared that the lesion in such cases exerted some effect upon the motor system, whether upon the cortex or anterior horn cells of the spinal cord was not clear. Further, he said that there was no doubt that the movements were increased by peripheral stimuli. One patient now under his care at Finchley illustrated this—when lying in the bath he was quite still, when in bed was practically still, but immediately on sitting up or walking about the movements became very pronounced and severe. It was probable, therefore, that some peripheral stimuli had the effect of exciting the movements or making them worse. All the evidence pointed to some upsetting of the action of the motor system, either in the cortex or in the anterior horn cells of the spinal cord.

Dr. HENRY HEAD regarded all the four cases as most interesting, but did not consider them as all belonging to the same group. Dr. Stewart's case was a singularly pure example of a condition which had been wrongly called congenital and spastic athetosis, because it was not a true athetosis, and it was not spastic. He knew one patient with this condition intimately, and had been in his company a good deal for a good many years, and so far from being mentally deficient he was really a mechanical genius. He drove a motor car skilfully and rapidly, had married and had a normal child. He did not regard the condition as an abiotrophy or family disease. Dr. Collier's three cases did not seem to belong to the same group; the movements, the age, and the whole appearance were different.

Dr. J. A. ORMEROD said he had seen some years ago a case which, in some respects, was like the first case of Dr. Collier's series—viz., that of a man in whom muscular spasms interfered with his speech. This man progressively developed spasm of the facial and other muscles, which rendered his speech unintelligible. His face was subject to contortion and his laryngeal and respiratory muscles were involved so that his speech was a series of explosions and squeaks. But in his case the jaw was not affected. The disease had

begun ten years before he (Dr. Ormerod) saw him, with a curious paralysis of the eyes. When first seen he was unable to move his eyes upwards, and he also had wryneck. When the patient lay down and did not try to speak he seemed natural, but the effort to speak produced an affection of his face and of his speech so disquieting to him that at last he withdrew himself from observation. On one occasion he was brought to a meeting of the Neurological Society, and two members said they had each seen a case like it. One of these cases was in Marylebone Infirmary, where the patient died. A post-mortem examination was made, but nothing wrong was found.

Dr. LEONARD GUTHRIE said the profession was greatly in need of pathological information as to what was at the bottom of these cases of marked athetosis or post-hemiplegic chorea, the latter of which was a very bad name. Although probably the pyramidal tract was not affected, and some part of the region of the optic thalamus or red nucleus was affected, one could not exclude the possibility that the cortex might play some part in producing the symptoms. In 1895 he had an opportunity of investigating this point. The case was that of a man, aged 25, who swept a crossing in the neighbourhood of Regent's Park. At the age of 3 he had whooping-cough, from which he recovered. He then had some prostrating illness, the details of which had not been forthcoming, but at the end of it he was found to have the movements on the left side, which continued. After a time they were apparent on the right side also. When Dr. Guthrie saw him, at the age of 25, he was a most extraordinary person. The movements of the left arm were so violent that they could only be described as jactitations. He had learnt to control them by keeping his left hand inserted beneath a strap passed round his waist. If one undid the strap his arm flew over his head, and he struck out with it in all directions, so that one had to take care to keep out of range. He subdued it by seizing his left wrist with the other hand, wrenching the limb downwards to his left side, and inserting the hand beneath the strap. His left leg was in practically the same condition; he rotated inwards the whole of his lower limb when walking, kept the foot strongly inverted, and raised the foot high at each step. He also had proptosis and external deviation of the left eye, and some dilatation of the pupil. The speech was very difficult; he squeezed his words out, and talked very slowly indeed. The movements incapacitated him from doing ordinary work, and, on consideration, it was decided to trephine him; this was done on the right side by Sir A. Pearce Gould. On taking off the dura mater, there was noticed to be some oedema of the subarachnoid; beads of lymph repeatedly welled through the subarachnoid and arachnoid, and trickled down. Certain parts of the cortex were stimulated by a battery; the result was not to produce more movements of different parts, but genuine Jacksonian epilepsy. An electrode was applied to the facial centre, and a fit was produced, beginning in the facial muscles and extending to the whole body. Another electrode was applied to the thumb centre and a Jacksonian fit was produced, which gradually spread through the body. A portion of the cortex, $1\frac{1}{2}$ in. in diameter, at this site was excised. It was histologically normal. When he came round from the

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anæsthetic the movements had quite ceased; he lay quiet, was rational and intelligent. The left arm, which had been the seat of the violent ataxia, was now flaccid, and there was no power in it. Next day he had a series of Jacksonian epileptic fits, mostly on the left side, and later on attacking the right side of the body. He had seventeen of these fits in all, and then they ceased; he had never had a fit before the operation, or after the week which followed the operation. The left arm then recovered almost normal movements; he could raise it and put it above his head, shake hands, &c., without ataxia. Then the movements gradually began to reappear, and at the end of a fortnight they became almost as violent as before.¹ He thought that the obvious irritability of the cortex showed that the cortex must play some part in the production of these movements, though no doubt the basal ganglia were also affected. He asked whether there was any exact pathological information available as to what was the lesion in these cases of violent so-called choreiform movements.

Dr. JAMES TAYLOR said that he could recall a case of which he did not think the details had yet been published—namely, one of hemiplegia with athetosis. It was under the care of the late Dr. Beevor when he (Dr. Taylor) was his house physician at Queen Square Hospital. The athetosis was very definite, in the left hand especially, and a portion of the cortex was excised, that part which was concerned with hand movements. The patient had a series of Jacksonian fits following the operation, and for ten days after complete flaccid paralysis of the left arm. The movements then recommenced and became as violent as ever. A larger part of the cortex was then removed, but the wound became septic, and the patient died. The case was very interesting, because it showed that, whatever the cortex had to do with the production of athetosis, that was not the sole source of the mechanism. He thought it possible that in such cases there was a lesion in the basal ganglia, and the balance between the basal ganglia and the cortex became disturbed, so that irregular movements ensued. He did not think athetosis could be produced from a lesion in the cortex itself, and his own feeling was, that these athetoid movements, both in the hemiplegic cases, and possibly also in the cases shown that evening, originated in disease of the basal ganglia.

Dr. COLLIER replied that he thought the symptoms in all the three cases were of the same order, though differently distributed in each case. Cases of this type had hitherto been described under the term "bilateral athetosis." He did not think the second case approximated to the type of Huntington's chorea, for in a family of whom he knew several members the movements were of an entirely different nature, and closely resembled the movements of Addison's chorea. His mention of the lenticular nucleus was simply in relation to so-called "tetanoid chorea," which was described by Sir William Gowers, in

¹ Cf. "A Case of Violent Jactitations of Twenty-two Years' Duration, affecting chiefly the Left Arm and Leg," *Proc. Roy. Med. Chir. Soc.*, 1897 (3rd Series), ix, pp. 30, 63.

which lesions of the lenticular nucleus were constantly found. He had nothing to say in regard to the pathology of these cases, except that he believed Dr. Gordon Holmes had recently examined one of them post mortem, and did not succeed in finding anything abnormal in the brain.

A Peculiar Case of Congenital Paralysis.

By JAMES COLLIER, M.D.

A. L., AGED 13 months. Parents healthy. Seven children alive and well. Birth at full term. Breech presentation and difficult labour. It was noticed on the day of birth that the legs were disproportionately small and that they could not be passively straightened owing to flexor contracture at hip and knee. When 2 days old he was taken to Great Ormond Street Hospital and was treated with splints and massage. Later he was treated at Guy's Hospital. The contracture of the legs has diminished but he has never moved them below the knees. He is a well-nourished, intelligent child. The head and upper extremities are quite normal. He cannot sit up properly, though he constantly makes the attempt to do so. The thighs, and more especially the legs, are small and there is flexor contracture at hip and knee. The thigh muscles—flexor, extensor, adductor and abductor—are weak, but movements are readily and quickly performed. No movement of any muscle below the knees, and in these muscles there is no response either to faradism or galvanism. There is marked backward tilting of the pelvis due to psoas weakness. There is no sensory loss. The knee-jerks have not been obtained. There is a marked post-anal dimple. A skiagram of the back shows that the vertebræ, arches and spines are normal.

Paralysis of Sixth and Seventh Cranial Nerves in a Child.

By JAMES TAYLOR, M.D.

I. W., FEMALE, aged 6. She had measles in March but made a good recovery. Her left eye was noticed to "turn" in the middle of September. She had a slight knock on the head two weeks earlier, and her mother noticed that after this she was much quieter and less lively than before. She was brought to the Royal London Ophthalmic

Hospital on November 20 and seen by Mr. Worth, who referred her to me. The condition is one of internal strabismus of left eye and paralysis of left side of face. There is also perhaps some weakness of inward movement of right eye, and the question arises whether the paralysis is of cerebral or peripheral origin.

DISCUSSION.

Dr. TAYLOR said he was interested in the statement recently made that paralysis of one sixth nerve as a result of cold was frequent. On this subject he had always felt strong doubts, because it was known that paralysis of the seventh nerve after cold was very common, but he had never seen the association of paralysis of the sixth and seventh nerves after cold. In this child he regarded the causal condition as a central one, and he feared there was a tumour, probably a glioma, starting in the region of the sixth nucleus on one side.

Dr. HENRY HEAD asked if the involvement of the seventh nerve was ever due to cold; did cold play a part in the causation of Bell's paralysis? Was not facial paralysis one of a great group of nerve lesions of various kinds, which arose in consequence of conditions of which, as yet, very little was known? The best example was herpes zoster, which no one now thought of attributing to cold. The commonest area for peripheral lesions was the face, but the external popliteal might also be affected and other nerves might be attacked, where they either lay in bony canals or passed in close connexion with bone. He questioned whether they had a right to say that cold played any part in the genesis of ordinary facial paralysis. The question was whether such cases of paralysis did not belong to a great set of diseases, the causes of which were still unknown, but which could be observed to occur in groups or cycles.

Dr. WILFRED HARRIS asked if the taste sensation had been tested, and said that if it was a peripheral lesion of the seventh nerve, whether due to cold or not, it was probably due to a degenerative neuritis below the geniculate ganglion. Such cases were most intense in the neighbourhood of this ganglion. In severe rheumatic facial palsy, loss of taste on the front half of the tongue was almost invariable. If this case was of that type, the patient should have lost taste, but not if the lesion was central.

Dr. F. E. BATTEN said that if the lesion in this case was nuclear there should be weakness of the internal rectus on the opposite side, and failure in conjugate deviation of the eyes to the paralysed side. There seemed to be no evidence of this, and therefore he assumed the lesion was peripheral to the nucleus of the sixth. Possibly there might be a nuclear lesion in the seventh which at the same time affected the fibres of the sixth after they left the nucleus. He had seen a lesion of the seventh nerve nucleus in a case of poliomyelitis, leaving the sixth nucleus intact.

Dr. JAMES TAYLOR, in reply, said he had grave doubts as to cold alone causing anything of this kind; but in some cases the history of exposure to cold before the onset of the paralysis was so definite that one was justified in looking on cold as a predisposing cause. He agreed that often facial paralysis could be observed to occur in epidemics of herpes zoster. He had seen herpes associated with that paralysis, and he considered there was something in common between the two; still, he demurred to the tendency to abolish cold as a contributing cause of facial paralysis. He agreed with Dr. Batten and Dr. Buzzard in holding that facial paralysis was by no means invariably associated with loss of taste, and thought Dr. Harris had misunderstood him with regard to the case, as he brought it forward to elicit opinions as to whether the cause was central or peripheral. There was no affection of taste in the patient. It was true there was a possibility of poliomyelitis in the case, but he thought, contrary to Dr. Batten, that there was weakness in the internal movement of the right eye. Dr. Holmes, when examining the case independently, came to the same conclusion, and thought the condition was the result of an affection of the sixth nucleus on the left side.

Four Cases of Facial Paralysis treated by Hypoglosso-facial Anastomosis.

By PERCY SARGENT, F.R.C.S.

Case I: Left Facial Palsy.—I. C., aged 54, attended the National Hospital on June 17, 1910 (Dr. Batten). Left face had been gradually becoming paralysed for a year. Hearing impaired also. Examined by Mr. Scott: No suppurative ear disease. "Symptoms resemble those of obstructive deafness rather than nerve deafness." Electrical reactions: No response to faradism; to galvanism typical R.D. Operation (April 12, 1911): Hypoglosso-facial anastomosis and anastomosis of N. descendens cervicis, with peripheral end of hypoglossal.

Case II: Left Facial Palsy.—M. S., aged 19. National Hospital (Dr. Ormerod). Attended May 11, 1908, for "almost" complete left facial palsy, not of otitic origin. Taste retained on anterior two-thirds of tongue. Treated with galvanism. Electrical reactions: Faint flicker to strong faradic current in lower part of orbicularis palpebrarum. Slow response to (6 ma.) galvanic current A.C.C. > K.C.C. No improvement after two years' treatment. Admitted August 26, 1910: Hypoglosso-facial anastomosis, and a slip of spinal accessory joined to peripheral end of hypoglossal. Some paralysis of sterno-mastoid and trapezius resulted.

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Case III: Left Facial Palsy.—R. B., aged 9. National Hospital (Dr. Ormerod). Admitted July 18, 1910. Operation for mastoid disease, March, 1906. Complete left facial palsy; no response to faradism; slow response to (2 ma.) galvanism. A.C.C. = or > K.C.C. August 3, 1910: Complete mastoid operation and removal of a large sequestrum. October 10, 1910: Cavity healed. Hypoglosso-facial anastomosis. There was no response on stimulating facial nerve with strong faradic current.

Case IV: Right Facial Palsy.—E. B., dressmaker, aged 41. National Hospital (Dr. Grainger Stewart). Operation for mastoid disease, January 23, 1908. Came to National Hospital, June 30, 1908, with complete right facial palsy and ear still discharging. Electrical reactions: No response to faradism; galvanic response greatly diminished and A.C.C. > K.C.C. Mastoid operation, March, 1909: Much disease found; posterior wall of bony meatus found intact, but facial canal had gone; grafted; healed by July. October 15, 1909: Hypoglosso-facial anastomosis; peripheral end of hypoglossal joined to central end of anterior half of spinal accessory. October 22: Electrical reactions of tongue to faradism, decreased response with slow contraction; response to galvanism brisk and rather increased. October 24: Still reacts to faradism, though still further diminished; brisk reaction to galvanism and K.C.C. > A.C.C. October 28: A.C.C. > K.C.C. November 1: Tongue looks wasted on right side; slow contraction to strong faradism; galvanic response brisk and equal on the two sides; A.C.C. > K.C.C.

A Case of Cerebral Diplegia treated by Posterior Root Section.

By OTTO MAY, M.D.

THE patient, A. P., aged 5, is one of a family of nine, the other eight all being healthy. He was one of a twin pregnancy, the other child being born dead. Labour was premature, at the seventh month. No instruments were used, but the child was said to have been extracted "with much pulling" by the midwife.

He was brought to the Evelina Hospital in October, 1910, for inability to stand or walk. On examination he was found to present a typical picture of a fairly severe case of cerebral diplegia, affecting the legs. These were very rigid, and showed extreme spasm of the adduc-

tors, hamstrings and calf muscles. All the deep reflexes of the lower limbs were greatly exaggerated, and there was a double Babinski sign. The upper limbs were unaffected. His general aspect suggested some mental deficiency, though in the ward he showed himself to be a great talker and clever mimic. He has never had any epileptic attacks.

In March, 1911, Mr. H. S. Clogg consented to perform the operation of posterior root section. This was done in two stages, Küttner's technique being followed, the second, third, and fifth lumbar, and second sacral roots being resected on each side. About $\frac{1}{2}$ in. to 1 in. of each root was excised. The immediate result of the operation was a loss of practically all the spasm, with abolition of both knee- and ankle-jerks, though the Babinski response could be elicited throughout. After-treatment has been conducted on the lines laid down by Foerster.¹ The knee- and ankle-jerks gradually returned after an absence of about three months, and both are now brisk. Further, in the last two months the spasticity has returned to some extent, so that the passive movements of the legs are not quite so free as they were three months ago. His powers of walking are somewhat disappointing. At first his efforts showed marked ataxia and weakness; in spite of careful teaching he is still unable to walk without support, as he seems totally lacking in the power of balancing himself; indeed, his ataxia does not seem to have improved *pari passu* with the return of the deep reflexes.

DISCUSSION.

The PRESIDENT (Dr. F. W. Mott, F.R.S.) asked what was the condition of the sensibility in the soles of the feet. Long ago, Professor Sherrington and he did some experiments on section of posterior roots. By cutting those roots, ataxy was produced. If all the roots of the upper limb were cut there was complete loss of power, and he considered that it was due to loss of tonus. Dr. May's case was interesting because there was a very important root, the first sacral, still left, he supposed purposely.

Dr. F. E. BATTEN asked how Dr. May had identified the roots.

Dr. MAY replied that no sensibility changes had been detected, but the patient was not a very intelligent subject. This fitted in, however, with Sherrington's results, that, in monkeys, gross sensory loss was not obtained unless at least three consecutive posterior roots were cut. As the President had suggested, the first sacral root was left in accordance with Foerster's rule, never to divide three consecutive roots. By observing this, one avoided the production of gross sensory loss, and also the danger of completely depriving any group of muscles of its afferent innervation. In answer to Dr. Batten,

¹ For fuller details vide *Lancet*, June 3, 1911, pp. 1489 et seq.

the operation was performed by Mr. Clogg, not by the speaker. Küttner's technique was followed, the operation being done in two stages. At the first stage guiding sutures were put through the muscles at the level of the fifth lumbar spine. This was said to correspond to the exit of the first sacral root from the dural canal. This root was definitely larger than the succeeding one, a point which was useful in confirming its identity. He had seen museum preparations at the Virchow Krankenhaus in Berlin illustrating these landmarks, but he had not confirmed them himself by dissection. Mr. Clogg operated on a similar case of his two weeks later, with almost identical result. In the second boy, however, there had been a definite return of ankle-clonus. This must be regarded as a result of the integrity of the first sacral root, rather than as a sign of regeneration of the other roots.

Dr. F. E. BATTEN asked if Dr. May had verified the observation that the first sacral was larger than the second sacral root. He doubted the observation that they could be distinguished by their size. He had seen two cases operated upon, and realized the difficulty of localizing the roots.

The PRESIDENT said that when he and Professor Sherrington performed the experiments on monkeys, the first sacral was considered the largest root, and if that was left, the same effect was not produced as from cutting all the roots. It had taken a man the whole of that day to get out a spinal cord and the roots with all the ganglia. They would be numbered consecutively, and he would then be able to make some observations regarding the relative size of the roots. But as the case was one of tabes of twelve years' standing, and the first sacral would be damaged more than any other, the observation might not be valuable. He asked whether Dr. May thought the roots would grow into the sclerosed tissue of the spinal cord. He had never seen it in any of the monkeys he had operated upon, although some of them were kept alive for nine months.

Dr. MAY, in further reply, acknowledged that the limb plexuses varied, so that there was a danger of occasionally meeting one of the "prefixed" or "post-fixed" type. If, however, care was taken to leave the larger root intact it did not matter which one it happened to be in anatomical language. The larger one would be the functional analogue of the normal first sacral, and therefore the root which it was advisable to leave intact.

A Case of Cerebral Monoplegia ?

By OTTO MAY, M.D.

THE patient, H. C., was brought to the Evelina Hospital in July, 1909, as it was noticed that he was dragging the right foot. He was aged $1\frac{1}{2}$, and was the youngest of a family of five, the other children being all well. He was healthy at birth, which was normal, without

instruments. At 2 months he had a bad attack of diarrhoea. At 6 months it was noticed that the right leg seemed rather weak in crawling, and this weakness persisted, so that, on beginning to walk, he had a slight limp. On examination, the right leg was found to be very slightly shorter than the left, but with no obvious wasting. The knee-jerks were equal, and there was no spasticity. The right plantar reflex was doubtful; occasionally it seemed to be of the extensor type, but this was inconstant. The electrical reactions showed no change except a slight diminution of the response to faradism in the extensors of the ankle and foot. By September 20, 1909, the plantar reflex had become definitely extensor.

He was lost sight of till January, 1911, when it was found that the right leg was 1 in. shorter than the left, and the thigh 1 in. less in diameter. In addition he had developed definite pes cavus, and the limp had become more pronounced. The right leg is colder than the left, and the extensor response is very easy to elicit. The extensor (anterior-tibial) group of muscles still react poorly to faradism, but there is no typical "reaction of degeneration." In contrast to the other case shown to the meeting there is no trace of spasticity in the limb. Recently the boy has had two attacks strongly suggestive of "petit-mal"; this is confirmatory evidence of the cerebral origin of the monoplegia, which is presumably the result of cortical hæmorrhage or encephalitis.

A Case of Hypo-pituitarism.

By P. W. SAUNDERS, M.B.

J. B., A BOY, aged 14½ (in the National Hospital under the care of Dr. F. E. Batten), the fourth of seven children, is said to have been in no way abnormal up to the age of 13, except that he was dull at school. A year ago he began getting very fat.

On admission to hospital he was 4 ft. 6 in. in height and weighed 7 st. 9 lb. The subcutaneous fat is very abundant and presents female characteristics in its distribution. The penis and testicles are small and infantile in appearance. There is no development of pubic hair or other secondary sexual characteristic. Mentally, the boy is intelligent, but somewhat lethargic. In other respects physical examination is negative. There is no hemianopia and no optic atrophy. There is some confusion in the recognition of colours, but no definite loss of colour fields.

Skiagram shows no abnormality of the sella turcica. There is no glycosuria.

The patient shows marked tolerance for sugar, as much as 300 grm. of glucose having been given to him without causing any glycosuria or change in the urine.

The case is presented as an instance of Fröhlich's syndrome of dystrophia adiposo-genitalis occurring apart from the presence of pituitary tumour. There is no evidence at present of the existence of a pituitary tumour in the patient, and the case is considered to fall into that division of cases of hypo-pituitarism described lately by Cushing, in which the glandular deficiency is primary. The condition may be, to a certain extent, the expression of a polyglandular syndrome, the inter-association of the different glands of internal secretion being very close normally, but as far as experimental and clinical evidence at present goes, it is considered justifiable to regard the case as showing mainly a pituitary fault.

DISCUSSION.

Dr. HENRY HEAD believed the condition was not due to hypo-pituitarism, but to a sexual abnormality; the breast tissue was enlarged and veins were prominent, whereas in those cases of hypo-pituitarism that he had seen the breasts were large, but consisted mainly of fat. The genital glands were so badly developed that the patient should be regarded as sexually malformed, with a tendency to feminine development. The pelvis was of the female type.

Dr. LEONARD GUTHRIE said he had seen the case before when it was under Dr. Batten, and he then thought the patient was eunuchoid because of the large breasts and the general feminine configuration. He did not see why, when there was an obvious ill-development of testicles, appeal should be made to the pituitary body to explain the matter. Artificially made eunuchs acquired the same appearance as this boy presented, and among certain tribes of Indians functional castration resulted in a like conformation; and it was said that the breasts even secreted milk under such circumstances. It might be a case of gynæcomastia in a person who was neither man nor woman. He considered the secret of the condition here was probably a want of development of the testicles. But the latter were intimately related, in function, to the pituitary and other ductless glands, and often one did not know which was at fault.

Dr. A. E. GARROD said the consumption of a large amount of sugar and failure to pass it in the urine was observed in cases of the kind, as also in cases of myxædema when not being treated with thyroid. This present case recalled the picture of Fröhlich's syndrome. As the obesity and other symptoms had developed very much in the past year they could not be ascribed to a congenital condition.

Poliomyelitis, with Extensor Response.

By P. W. SAUNDERS, M.B.

E. F. AGED 4, a patient in the National Hospital under the care of Dr. Taylor, two and a half years ago had a "feverish attack" and, in the course of one day, the left leg became powerless. The other leg and the arms were said not to have been affected.

On admission to hospital a few weeks ago the patient was found able to walk, but both legs showed considerable weakness. The left leg presented a condition typical of old poliomyelitis, while in the right there was a brisk knee-jerk, marked ankle-clonus, and a definite extensor response. The case was shown from the interest attached to the occurrence of the clonus and extensor response in poliomyelitis.

Case of Peroneal Atrophy, with Signs of Friedreich's Disease.

By J. GODWIN GREENFIELD, M.B.

L. L., AGED 25. Patient is an only child. No paralysis in family. Illness started at the age of 18, with weakness of the legs and dragging of the feet in walking. For the last four years unable to walk alone. Five years ago weakness of the hands commenced, and has progressed; great difficulty in holding a pen; writing is very shaky. From onset of illness the great toes were drawn backwards. Early in the disease she had some precipitancy of micturition.

Present condition: Wasting of small muscles of both hands, especially the lumbricals and first interosseous space, and of all the muscles below the knee, chiefly in the anterior tibial and peroneal groups. The wasted muscles do not respond to faradism or moderate galvanism. Very marked "pes cavus." Considerable "drop-foot." Marked nystagmus to either side. Speech slow and slurred. Considerable intention tremor, and slight inco-ordination in both hands. Gait reeling and ataxic; tends to invert her feet. Absence of all deep reflexes; abdominals present; plantars indefinite. No sensory change, except some loss of sense of position in the toes and slight cutaneous loss over ankles and feet.

DISCUSSION.

Dr. GREENFIELD, in reply to the President, said there was no scoliosis in the case.

Dr. J. A. ORMEROD said that in this case there were certain things which were not explained by the peroneal atrophy, such as a slight affection of speech, some nystagmus, and absence of knee-jerk, albeit the thigh muscles were fairly well preserved. But he would not like to say for certain that this patient had Friedreich's disease.

A Case for Diagnosis.

By T. JEFFERSON FAULDER, F.R.C.S., and
E. FARQUHAR BUZZARD, M.D.

E. H., A MARRIED woman, aged 34. Ten years ago some trouble in her right wrist, which was swollen and painful. It was doubtful whether an operation would be necessary, but it recovered more or less completely in the course of a year. Two and a half years ago, at the beginning of her third pregnancy, she had a sore throat. Soon afterwards she noticed the swelling on the right side of the neck, drooping of the right upper eyelid, and "a feeling of paralysis" across the face. Since that time she has had bad attacks of breathing. She says she feels as if she could not breathe from her stomach. There has been no alteration to speak of either in the swelling in the neck or in the condition of the right eye. During the last three or four months the shortness of breath has been more severe. She has felt weak in her legs, and has had some headache and occasional vomiting, without reference to food.

Present condition: Right palpebral fissure and pupil smaller than left. Both pupils react briskly to light, but the right pupil dilates slowly to shade. The right upper eyelid is not fully retracted on looking up. Ophthalmoscopic examination negative. Weakness of the right side of the palate and of the right vocal cord. Displacement of larynx with slight rotation to left side. Some tremor of hands. Right-sided goitre. No signs of disease in other parts of the nervous system. Reflexes, &c., normal.

A Case of Myotonia Atrophica.

By E. G. FEARNSIDES, M.B.

W. P., AGED 52, male, a house painter and decorator (under the care of Dr. Head). This patient first came under observation in June, 1911. Since then his condition had shown little or no alteration. As a youth he was abnormal, for he well remembers his embarrassment when, at the age of 15, he found that after shaking hands with visitors "he could not let go." This difficulty with his right hand has been present to a greater or less extent ever since that time. Fifteen years ago, at the age of 37, he first experienced difficulty in controlling his feet. At that time he was able to walk at a good rate, but his feet would "flap" and his toes drag. He was able to do a full day's work until 1900, when his eyesight began to fail. He continued at work until 1903, when, partly on account of his eyesight and partly on account of his increasing difficulty and slowness in progression, he had to give up all systematic work. He first sought medical advice in 1911, when his case was diagnosed as one of myelitis, and he was treated with potassium iodide, a line of treatment which he maintains increased his weakness and led to mental depression and irritability. The difficulty in walking has increased considerably in the last year, but he thinks that the condition of his right hand has not altered since boyhood.

As a child the patient suffered from measles and whooping-cough; at the age of 10 he had an attack of scarlet fever; at 11 he caught small-pox. From that time until 1903 he enjoyed the best of health. In the winter of 1903 he had two attacks of influenza, the second of which was followed by nephritis and catarrh of the bladder. Since 1904 he has been subject to attacks of bronchitis, polyuria, and nocturnal frequency of micturition. He denies all venereal trouble and the possibility of infection. He has been connected with paints and the painting trade for over thirty years, but has never suffered from any symptoms suggestive of lead poisoning. Since 1903 he has had no contact with paint. He has been a lifelong teetotaller.

Family history: The patient is the eldest of seven children, six of whom survive. Two sisters suffered from cataract; his youngest sister has recently developed foot-drop; with these exceptions all his brothers and sisters are normal and in good health. His father, aged 73, is alive and well. His paternal grandfather died at the age

of 90. There is no history of neuropathy or myopathy in his father's family. His mother, whom he remembers as having a "peculiar walk like his own," died at the age of 70. She was an orphan. She was brought up by her aunt and nothing is known of his maternal grandparents. The two sisters of his mother are, as far as could be ascertained, quite normal. He is married and his wife is alive and well. His two children are both dead. The elder, who had the "same style of walk as his father and couldn't put his feet together and stand up," died at the age of 17 from pneumonia; the younger, who died at the age of 13 from cerebral embolism, following an attack of rheumatism, as far as was known showed no muscular peculiarity. The patient himself is quite sure that the disease is hereditary, but seeing that the affected members of the family are all dead, save the affected sister who lives in the country, this has not been demonstrated by examination.

Present condition: The patient is a stout, well-proportioned man of small size; his height is 5 ft. 4 in., and he weighs 11 st. 6½ lb. Speech is somewhat slow and the words are a little slurred; this, he says, has always been the case. *Eyes*: The pupils are equal, regular, of medium size and react well to light and on convergence; there is a cataract in the left lens and some opacity in the right; the eye movements are of good range; there is no ptosis and no nystagmus; the fundi are normal. *Muscular system*: The face is flattened and expressionless; the orbiculares palpebrarum are very weak, the power of voluntary resistance to the opening of the closed eyes is feeble, and the orbicularis oris is weak. The face is somewhat asymmetrical, the left cheek being hollower than the right. He is able to whistle and to blow out his cheeks. The masseter and the temporal muscles contract strongly on voluntary movement. The tongue is protruded straight and is not tremulous; the palate movements are normal, and there is no laryngeal paralysis. The sterno-mastoids and outer halves of the trapezii on both sides are small, and on the right side definitely wasted; the deltoids on both sides are somewhat small, the lower half of the right is more prominent than the corresponding portion of the left. The other muscles round the shoulder, together with the biceps and the triceps, are not affected. The forearms are symmetrical. The right hand is hollowed and tends to be bluer and colder than the left. All movements at the shoulder and elbows are good in range and power. Flexion and extension at the wrist are good and of fair power. There is no wasting of the small muscles of the hands. When the patient is asked to shake hands or grasp an object he does so quickly and with fair force, but when

he is told to let go there is always a considerable latent period before he can open his hand completely. A repetition of the movements of opening and closing the hands as rapidly as possible leads to a gradual disappearance of this latent period and to a great increase in the rate at which movements can be made. When the right hand opens the index finger is first extended, followed by the little finger, and the middle fingers follow at from a half to three seconds later, the exact length of this delay in movement depending upon the number of times the movements have been repeated. The difficulty in extending the fingers is due to delay in relaxing the flexor muscles, for a contraction can be felt in the extensors an appreciable time before the extensor movements become visible. It is noteworthy that if the patient simply flexes his fingers without force, he is able to relax at once; the stronger the force of the original grasp the slower the relaxation. The delay in relaxation is more evident and of greater duration in the right hand than in the left. The muscles of the trunk and abdomen are well developed. The spine is straight and its movements natural. The thighs are well developed in comparison with the rest of the leg; the buttocks are normal. The adductors and flexors of the thigh are well developed; the lower portions of the extensor muscles on both sides are somewhat small. The range and power of all movements of the hip and knee are good. The musculature of both legs below the knee shows a considerable degree of wasting; the wasting affects the calf muscles to a greater extent than the other groups. The left leg appears the more wasted, and its diameter in the transverse direction is less than that of the right. The circumferential measurements, however, fail to show any certain differences of the two legs at corresponding points. The wasting of the calves was first noticed by the patient in January, 1911, and it has not increased in amount during the time that he has been under observation. Dorsiflexion at the ankle-joint is limited in range on both sides, and both dorsiflexion and plantar extension are weak. The gait is slow and stiff. The patient shows double foot-drop, more evident on the left side than on the right. This foot-drop is apparently the cause of the "flapping," which is the complaint for which he first sought medical advice. After resting he is able to start off at a slow pace. His first few steps are always stiffer and more studied than his later stride. After walking about a hundred yards he rapidly becomes tired and his rate of progression slower and slower. *Reflexes:* His knee-jerks cannot be obtained even with reinforcement; his ankle-jerks are absent. The plantar reflexes are sluggish and the

toes go down. *Sensation*: The patient complains of "pulsation twitches" as if his muscles were contracting "on their own" in various parts of his body. They are especially troublesome on the left side—in his left groin, left loin, and left thigh. Sensation to all ordinary tests is intact. *Vasomotor*: The feet on both sides are always cold. They present a somewhat blue, mottled appearance. Telangiectases in the form of spider-like, dilated, superficial capillaries, are prominently visible around the ankles. Towards the end of the day soft œdema appears over the backs of the feet. The skin over the feet is always stretched and presents a wrinkled appearance.

Electrical and mechanical reactions: The response to instantaneous coil stimuli and to the make and break of constant currents is not abnormally prolonged. K.C.C. is greater than A.C.C. To mechanical stimuli a great prolongation of response can be seen in the muscles of both upper and lower extremities, which is most marked in the flexor muscles of the right forearm.

DISCUSSION.

Dr. GREENFIELD said that in one family he had observed, there were four cases of cataract and five cases of undoubted myotonia atrophica; there had been senile cataract in previous generations, so that onset was by anticipation—a successively younger age of onset.

Dr. F. E. BATTEN said that in addition to the cases with cataract recorded by Greenfield there were those of Ormond in this country and Oberndorf in America. The interest of cases of myotonia atrophica was that they resembled one another so closely.

A Case of Unilateral Sweating of the Face.

By C. M. HINDS HOWELL, M.D.

H. K., AGED 46. History: In good health till September, 1911. Operation for double hernia on September 11. Good recovery, but noticed tendency to sweat following the operation. On leaving hospital noticed that, when he got warm or drank anything hot, there was marked sweating of left side of forehead and face, and not elsewhere.

Examination: Cranial nerves are normal, but the eyes are somewhat prominent, the left perhaps more so than the right, the pupils are equal and the palpebral apertures approximately so. The examination of the central nervous system is negative.

Neurological Section.

January 18, 1912.

Dr. H. H. TOOTH, C.M.G., Vice-President of the Section, in the Chair.

Progressive Myatrophy in Tabes Dorsalis.

By HOWARD H. TOOTH, C.M.G., M.D., and C. M.
HINDS HOWELL, M.D.

FROM the account related below it is clear that the case was one essentially of severe tabes dorsalis, with an unusual incidence and degree of motor paralysis and atrophy of muscles. It is on this latter account that we think it worthy of being added to the number of cases of this kind already recorded.

A minor degree of paralysis and atrophy, particularly of muscles supplied by the cranial nerves, is of common occurrence, but the exact cause of these is still open to question. For instance, a very common symptom is paralysis of the external rectus, or partial or complete paralysis of the third nerve. These lesions sometimes recover almost completely, and at least are subject to remission. Are they of nuclear origin, or are they due to some peripheral lesion of the motor nerves? The problem is practically the same on the sensory side—namely, is the initial lesion one of the posterior roots or of the ganglia? It might be said with reason that the cranial nerves, like the posterior roots, are bathed in a poisoned cerebrospinal fluid, and that such nuclear degenerations as are found, whether in motor nuclei or posterior root ganglia, are secondary to a neuritis. If that is the truth, we must assume that the anterior roots throughout the spinal cord are, as a rule, singularly resistant to this poison, and, *per contra*, the posterior roots very much less so.

In this case, as will be shown in the pathological report, there is an almost universal degeneration of the cells of the anterior horns, and of many of the cranial nerve nuclei, suggesting that this is the true

primary seat of the lesions causing the muscular weakness and wasting. It would seem, then, that the point of least resistance in tabes is in the sensory root ganglia, and that the great majority of tabetics present a symptom-complex indicative of little more than this. The motor neurones usually offer a higher resistance to the toxin, but in circumstances at present obscure may fall victims to it, as in this case, almost *pari passu* with the sensory. This vulnerability may be an individual peculiarity, or may be due to an unusual virulence of the toxin.

Occasionally the atrophic picture bears such a close resemblance to that of myelopathic progressive muscular atrophy, as in the case recorded by Dr. S. A. K. Wilson, that one is almost tempted to consider the possibility of the co-existence of two diseases, and, on the other hand, it is not surprising that some observers have suggested that progressive muscular atrophy and bulbar paralysis may after all be parasymphilitic degenerations. This view we are not at all prepared to entertain; some other toxin or vice of nutrition is yet to be discovered, but nevertheless it is interesting to find in a disease of undoubted syphilitic origin, like tabes, a series of cell degenerations and clinical features so similar to those of progressive muscular atrophy.

T. H. D., aged 35, late petty officer, R.N., admitted to National Hospital, March 1, 1911.

Past history: Contracted syphilis in 1895; treated in hospital for four months, and continued treatment for ten months. He was in the Navy twenty years, and has never been a heavy drinker.

Family history: Parents living, healthy; two brothers and seven sisters, all healthy.

History of present condition: Sixteen months before admission a progressive difficulty in walking, which had increased to such an extent that on admission he was quite unable to walk at all. At the same time there was numbness of the feet, suggesting soft flannel. For over a year he had suffered from "shooting pains" in legs and knees, occurring in attacks lasting for about two days once a month. The pain was constant, but paroxysms of great severity occurred, particularly during the night. The pain was referred to the tibiae. There had been a more or less constant girdle sensation round the upper abdomen. He also suffered from repeated attacks of vomiting and retching occurring daily for a fortnight at a time. At the beginning of the illness he complained of double vision, which lasted for eight weeks and then disappeared, to return again five months before admission, since when it persisted.

For two months there had been right ptosis; his vision had been failing somewhat all this time, but was better in the right eye than the left, so that he would raise the lid of that eye to get a good view of an object. Micturition was started with difficulty and there was occasional incontinence.

On admission: He was generally thin; weight, 7 st. 13 lb. Mentally he was bright, and gave a fairly good account of himself. His articulation was lisping, suggesting some paresis of lips and tongue; the tongue was tremulous and its left half was wrinkled and much atrophied. The palate moved well on phonation, but the pharynx was very insensitive, and there was no reflex. Vision, right and left, $\frac{6}{10}$; both disks pale, edges sharp and arteries small. Pupils of medium size, left slightly larger than right; neither pupil reacted to light, both reacted to accommodation and convergence. There was slight left ptosis, and complete ptosis on the right side. In the left eye external rotation was preserved, but all other movements practically absent except slight downward rotation. The right eye was paralysed in all its movements except external rotation. There was therefore complete paralysis of the right third nerve and partial of the left, but at this time no affection of either sixth nerve. There was no obvious weakness of face muscles, except of the lips, so that whistling movements were rather defective. Sensation on the face was altered; tactile sensation was preserved, but well-marked analgesia was found all over the face to about an inch above the brows, so that the upper area of the fifth nerve was least extensively affected. The jaw deviated slightly to the left when depressed, and the left masseter was wasted. Hearing was diminished in acuity both sides, tympanic was better than bone conduction. Motor symptoms and nutrition: Muscular power in the arms and trunk was fairly well preserved, but the legs were very weak and generally atrophied, the right more so than the left; the right heel could be raised from the bed with great effort a few inches only. There was double foot-drop, and plantar flexion was extremely feeble, particularly in the left foot. Hypotonia was very marked. Gait: He could just stand on the left leg if supported. Any attempt to walk provokes ataxic disorderly movements. Sensory symptoms: Tactile sensation was well preserved everywhere, but there was analgesia over most of the face and body, most marked perhaps on the ulnar aspect of the forearms and the outer side of the legs. Muscle pain sense absent. Co-ordination of movement in arms and legs very defective, so also was joint sense. Localization of tactile stimuli erroneous.

The patient was treated with potassium iodide and mercurial inunction on and off for four months, together with massage, faradism, and Fraenkel's bed exercises. His general condition certainly improved, also his muscular power, so that he was able, in two months, to walk a little with the help of the go-cart. The ptosis of the right eye was less marked, but by this time the paralysis of the right external rectus was complete. This improvement, however, was temporary only, and in July, five months after admission, the patient was in a deplorable condition. Ophthalmoplegia externa was complete, except for a slight $\frac{1}{8}$ in. deviation outwards of the left eye; ptosis double; slightly opposed by strong action of the frontales. Much atrophy of the masseters and temporals and very feeble bite; weakness of the mouth more marked; there was frequent choking with deglutition, and stridor when asleep; speech was monotonous, in a low pitch; the tongue was now wasted both sides and could not be protruded. The left sternomastoid was feeble in action, but not obviously atrophied. He could still get about with much assistance, but ataxia was very marked.

During the next two months the patient gradually became more helpless, until he was unable to lift either foot off the bed. Inco-ordination was more marked in the right arm; sensation was less deeply affected than might have been expected; tactile sensation to cotton-wool was acute everywhere, but pain stimuli were delayed in appreciation all over the lower extremities, ulnar areas, and to a less extent over the trunk; joint sense was lost in the legs and much affected in the arms, and particularly in the fingers; deep muscle pressure pain was absent in legs and thighs.

The urine from the beginning always contained pus and an appreciable quantity of albumin, and at the last some blood. The temperature was as a rule at or about normal, except during the last ten days of life.

The patient died of respiratory failure on August 11, about five months after admission.

POST-MORTEM REPORT BY C. M. HINDS HOWELL.

At the autopsy the bones of the skull and the vertebræ were found to be normal, but on removing the dura mater, which was normal, the leptomeninges were seen to be milky and somewhat thick. The third, fifth, sixth and twelfth cranial nerves were found to be wasted and smaller than their normal size. With regard to the spinal meninges the pia-arachnoid was a little thickened, particularly over the posterior

aspect of the cord, and more especially in the cervical and upper dorsal regions of the cord. Both posterior and anterior nerve-roots were decidedly smaller than normal.

In this research the following material was examined microscopically: The whole of the central nervous system, all the cranial nerves, with the exception of the first, and the Gasserian ganglia from either side. Many posterior root ganglia, and both anterior and posterior roots of many segments. The median, ulnar and peroneal nerves, and the following muscles—viz., temporal, tongue, eye muscles, thenar muscles and tibialis anticus. The tissues were placed in 10 per cent. formalin to harden.



FIG. 1.

Anterior spinal artery (hæmatoxylin-eosin). Note endarteritis and meningeal infiltration.

Examination of the Spinal Cord.

Sections were taken from nearly every segment of the spinal cord and examined by the following methods: Hæmatoxylin, Van Gieson, Nissl, Weigert-Pal, Marchi, and Ranke's Victoria blue.

(A) The Meninges.

There is some thickening of the pia-arachnoid, with a cellular infiltration of rather irregular distribution. This infiltration is densest round the blood-vessels, but occurs apart from them around the periphery of the cord. It is nowhere very intense. The types of cells

of which it is composed are chiefly lymphocytes, plasma cells and a few adventitial cells. Of these the lymphocytes certainly form the greater proportion. The thickening of the meninges, although quite definite, is not sufficiently pronounced to account for the changes in cells and peripheral nerves, which will be described later. With regard to the blood-vessels, these are definitely affected, but in a somewhat irregular manner. There is thickening of the intima in the larger vessels, particularly in the anterior spinal artery, and proliferation of the endothelial cells in the smaller blood-vessels (fig. 1). Amyloid bodies,

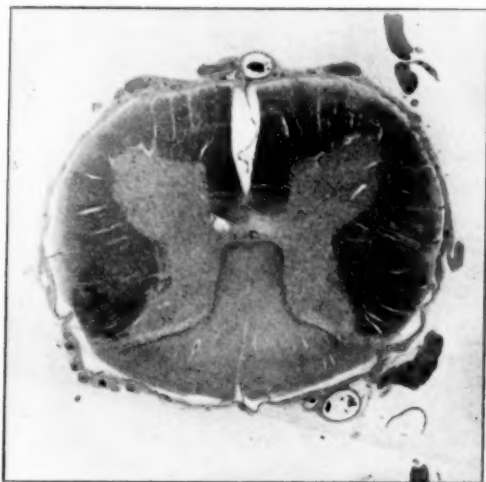


FIG. 2.

Section of spinal cord, second lumbar segment (haematoxylin-eosin). Shows extent of meningeal thickening and absence of vascular disease in spinal cord itself.

however, are absent. The thickening of the intima does not affect the whole course of the artery, as it might be seen in one section and be absent in another in a different locality of the same artery. It affects the whole circumference of the vessel.

(B) *Intramedullary Portion of the Cord.*

(1) *Blood-vessels.*—There is some endothelial proliferation in the smaller blood-vessels. There is little perivascular cell infiltration, except in the posterior columns. Here, in the areas of neuroglial

thickening, perivascular infiltration is definitely present, the cells composing it being chiefly lymphocytes; but other cells are present, these being chiefly macrophage cells. There is not present any marked proliferation of small blood-vessels, such as were noted in the case described by Merle as chronic progressive syphilitic poliomyelitis.

(2) *White Matter*.—In the posterior columns of the cord there is evident thickening of the neuroglia, resulting in a dense network of fibres staining pink with eosin. With regard to the rest of the cord, with the exception of some swelling of the myelin sheaths in the

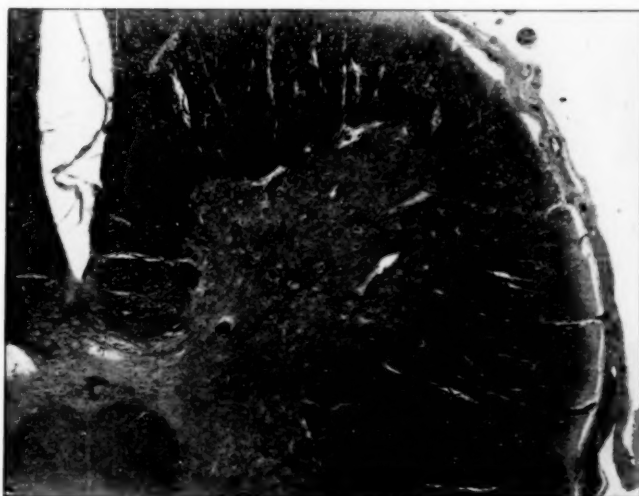


FIG. 3.

Ventral horn, second lumbar segment. Note great reduction in number of ventral horn cells. In antero- and postero-lateral groups of cells there should be thirty-six cells in this section; there are twelve—all degenerate.

cerebellar tracts and at the periphery of the cord, there is little or no change. There is nowhere any gross vascular lesion.

(3) *Grey Matter*.—The most striking feature in connexion with this is the alteration which has taken place in the nerve-cells; all the cell-groups of the grey matter are involved (fig. 2). The changes that have occurred are diminution in absolute number of cells present, and definite disturbances in those that remain.

(a) *With regard to the Diminution in Absolute Numbers*.—A large number of sections were examined in the cervical, dorsal and lumbar

segments of the cord (figs. 2 and 3), and the cells present in these were carefully counted. The following table shows the average number of cells present in various segments compared with the normal, as given in Bruce's Atlas. Examination of the accompanying table shows that the cell-loss includes ventral horn cells, lateral horn cells and Clarke's column of cells. The posterior horn cells were not actually counted, but they had shared in the same changes as the rest. All the cells seen in the sections were counted, including many that were in an extreme state of degeneration, and apparently about to disappear entirely.

TABLE OF CELL-LOSS IN VARIOUS SEGMENTS.

(N = normal, D = patient.)

Cell groups		C6		C7	
		N.	D.	N.	D.
6, 7, Cervical segments ...	Antero-mesial ...	9	4.2	4	4
"	Postero-mesial ...	5	2.25	5	0.5
"	Antero-lateral ...	11	7.5	35	5.5
"	Postero-lateral ...	35	13.5	26	12
Total cell-loss...		52.5 per cent.		65 per cent.	

2, 4, 5, Lumbar...		L2		L4		L5	
		N.	D.	N.	D.	N.	D.
"	Antero-mesial ...	7	—	5	2	18	9.5
"	Central ...	—	—	11	10	—	—
"	Antero-lateral ...	10	8.2	24	9.5	22	12.5
"	Postero-lateral...	26	8.5	50	12.5	50	13.5
Total cell-loss		47.7 per cent.		62.3 per cent.		60.6 per cent.	

Clarke's column ...		D3		D5		D8		D11	
		N.	D.	N.	D.	N.	D.	N.	D.
"	Clarke's column ...	5	3.1	10	2.7	14	7.8	11	6.8
"	Intermedio-lateral ...	18	4.1	20	1.8	12	3.5	16	6.6

It will be noted that the cell-loss in Clarke's column and intermedio-lateral group is also very striking; 50 per cent. of cells of Clarke's column were absent, and 75 per cent. of cells of intermedio-lateral group.

Consideration of the above table shows that the cells most affected in the ventral horns were the lateral groups. In the cervical segments examined there was a loss amounting to 52.5 per cent. in the sixth segment and 65 per cent. in the seventh segment. The first dorsal and eighth cervical segments had been used for other purposes, but in them the cell-loss was even greater so far as could be roughly estimated. In the lumbar segments examined the lateral cell-groups again were most affected. The total cell-loss amounting to 47.7 per cent., 62.3 per cent. and 60.6 per cent. in the second, fourth and fifth lumbar segments respectively.

(b) *With regard to the Character of the Changes present in the surviving Cells.*—There were two types noted. (i) In this, which is the commoner type, the cell was shrunken, distorted, and often elongated (fig. 4). In some instances, however, it has assumed a more globular form than usual. The Nissl granules have lost their definition and stain deeply. The nucleus, which is sometimes displaced towards one end of the cell or to the side, also stains more deeply than usual. In many cases a large part of the cell body is filled with yellowish pigment. It will be seen that these changes correspond closely to those observed in



FIG. 4.

Cells of hypoglossal nucleus (haematoxylin-eosin). Changes described under type (i) in text. These may be taken as typical also of a great many cells in ventral horns of spinal cord.

ventral horn cells in cases of progressive muscular atrophy. (ii) A certain number of cells, however, exhibit a different picture. They show various degrees of chromatolysis (fig. 5). For the most part the Nissl granules are replaced by a fine powdery substance which fills the body of the somewhat swollen globular cell. The nucleus is eccentric and the nuclear membrane more conspicuous than normal. Many cells are on the point of disappearing altogether. Others are vacuolated. In the spinal cord and also in the twelfth and sixth nerve nuclei the

cells of type (i) are more commonly met with. The motor nucleus of the third and fifth nerve nuclei shows the more acute chromatolytic changes in greater numbers than elsewhere.

(C) *Weigert-Pal.*

Sections stained by this method exhibited typical degeneration in the posterior columns, which is characteristic of tabes (figs. 6 and 7). As is usual in cases of tabes of not very long standing, various groups of endogenous fibres have survived. Such are the cornu-commisural tract,

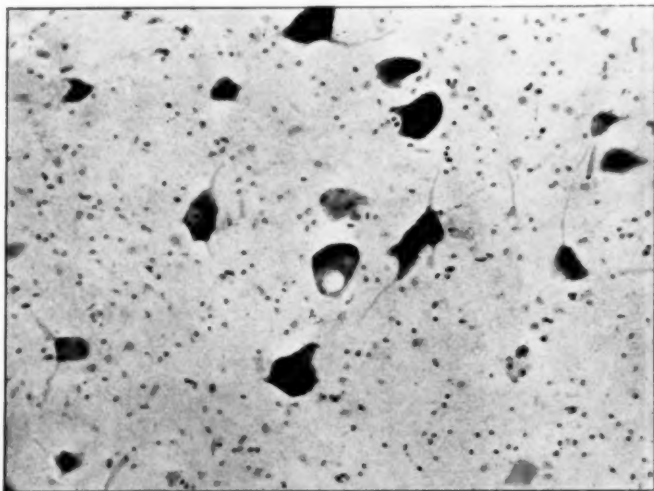


FIG. 5.

Cells of motor nucleus of fifth cranial nerve (Nissl). Illustrates chromatolysis and vacuolation of cells in this nucleus, also more chronic degenerative changes.

oval areas, common and septo-marginal tracts. There is a marked absence of fibres passing into Clarke's column, and examination of the column itself shows a striking absence of the usual meshwork of myelinated fibres. The same remark applies, but to a less extent, to the ventral horns. There is no degeneration to be seen either in the cerebellar or pyramidal tracts. Examination of the anterior and posterior roots shows marked degeneration, the posterior roots having suffered more severely than the anterior, though the latter are very considerably affected.

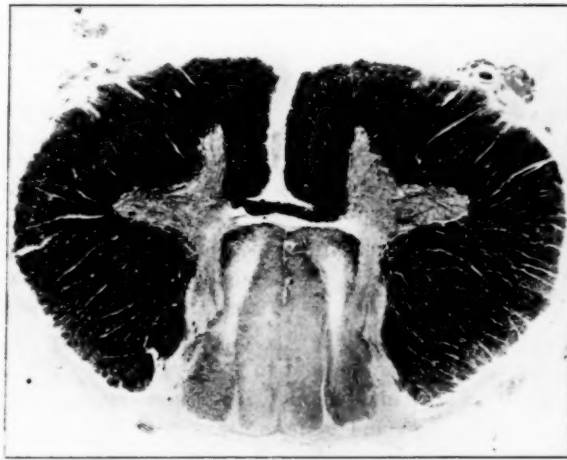


FIG. 6.

Weigert-Pal preparation, eighth cervical segment. Note endogenous fibres in posterior columns and absence of well-marked fibres in ventral horns and in anterior and posterior roots.

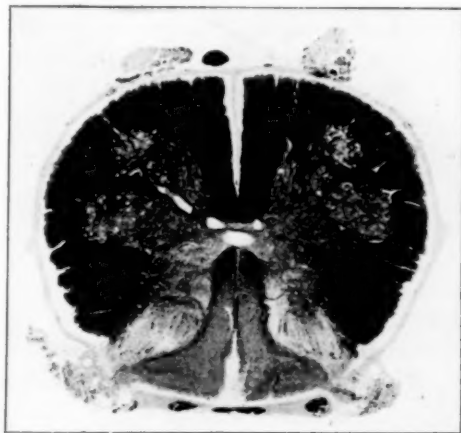


FIG. 7.

Weigert-Pal preparation, fifth lumbar segment. Note degeneration in posterior and anterior roots and survival of fibres in cornu-commissural zone and oval area.

It is worthy of note that the cerebellar tract stains well by this method, albeit with marked swelling of myelin sheath, whilst the cells in Clarke's column, as we have noted, are greatly reduced in numbers.

(D) *Marchi.*

Examination by this method shows both recent and old degeneration in the posterior columns of the cord, the old predominating. Large numbers of macrophage cells can be seen stuffed full of fat granules. These cells have accumulated in many places round the blood-vessels. There is some degeneration in the cerebellar and pyramidal tracts, but relatively very little, and what there is is diffuse. There is no marked degeneration of the intramedullary ventral root fibres by this method. There is some degeneration present in the anterior roots, but as in the case of progressive muscular atrophy the degeneration is comparatively slight. A posterior root and ganglion attached were examined by this method, and true degeneration traced in the posterior root right up to the ganglion cells. This observation is interesting and in opposition to the view of Nageotte and others of the French school who maintain that tabes is due to a transverse root neuritis produced by the meningeal inflammation so often found over the posterior columns in tabes.

The absence of marked degeneration in the cerebellar tracts is again to be noted. It would seem that the cell may die and even disappear without any effect on its axon so far as we can demonstrate, provided that death of the cell takes place slowly enough. In support of this I would quote Page May and Holmes, who found disappearance of Betz cells after transverse lesions of the cord, with no demonstrable change in the pyramidal tracts between the cell and the point of injury.

The Medulla Oblongata, Pons and Cortex.

(1) *Weigert-Pal.*

The degeneration in the posterior column of the spinal cord is continued up into the gracilis and cuneatus nuclei. There is also quite marked degeneration in the descending or spinal root of the fifth nerve on either side. This can be traced down to the lower part of the medulla.

(2) *Hæmatoxylin, Van Gieson and Nissl Methods.*

(a) The meninges show the same changes as those described in the spinal cord. There is undoubtedly thickening of the pia-arachnoid and

cell infiltration into this, such cells having the same appearances as those already described in the cord.

The sheaths of the ninth, tenth, eleventh, and twelfth nerves show considerable amount of this cell infiltration, but it is most marked in a definite perivascular distribution. Some of the intramedullary blood-vessels show this perivascular infiltration in a most marked manner. There are well-marked intimal changes to be seen in some of the blood-vessels, but all are not affected in the same degree. There is no thrombotic or other vascular obstruction to be seen in these sections.

(b) Cranial Nerve Nuclei.

Well-marked degenerative changes occur in the twelfth nerve nuclei on either side, chiefly characterized by shrinking, distortion of the cell, and dense staining of the cytoplasm. There is also the characteristic increase in pigment. Only very few cells show the swollen chromatolytic appearances presented by some of the ventral horn cells which have already been described. The nucleus ambiguus shows chromatolytic degenerative changes throughout its extent. The cells of Deiter's nucleus also show some degenerative changes.

The seventh nucleus: Hardly any changes are to be found in this nucleus. A few cells are somewhat globular, and a few nuclei are eccentric, but, on the whole, the cells stain well and are a good shape.

The sixth nucleus: Diminution in number of cells, shrinking of the cells, and chromatolytic changes on either side.

The fifth motor nucleus on either side shows very well marked chromatolytic changes, and fewer of the chronic degenerative changes were observed than in the ventral horn cells. No definite changes could be made out in the cells of the mesencephalic root of the fifth, although these were carefully looked for.

Third nerve nuclei show changes similar to those present in fifth motor nucleus; unfortunately, no sections of this nucleus were made by Nissl method, but only by hæmatoxylin and eosin. Still, it was clear that the changes described were present.

(c) Motor Cortex.

The precentral and paracentral gyri were examined by this method. No changes were noted in the Betz or large pyramidal cells.

Marchi Method.—There was, unfortunately, a diffuse degeneration present by this method throughout the sections examined, but the following points could be determined with certainty: There was very well marked degeneration of the fifth nerves within the pons on both sides. This degeneration could be traced down to the lower part of the medulla, but below this point it was obscured by the diffuse degeneration referred to above. It was impossible to say with certainty whether there was any degeneration in the mesencephalic root of the fifth. There was some degeneration in the posterior longitudinal bundle, which could be traced down into the spinal cord, but was lost in the upper cervical segments. There was degeneration of the tenth and twelfth nerve roots within the medulla. There was no degeneration of the pyramidal tracts, or of any cortical fibres. The fasciculus solitarius was not degenerate.

Cranial nerves: All the cranial nerves, with the exception of the olfactory, were examined by Marchi and hæmatoxylin and eosin methods. With the exception of the optic nerves, which seemed normal, they all showed practically identical changes, although the seventh were least affected and the fifth nerves most. The change consisted in the presence of rather coarse droplets which had stained with Marchi's fluid, but they were much fewer than one might have expected, and only occurred here and there through the nerve-fibres. With hæmatoxylin and eosin no evidence was found of any acute neuritic changes, or of any gummatous condition of the nerve. They appeared to have undergone simple atrophy, which was most apparent in the third, fifth, sixth and twelfth nerves.

Peripheral nerves—median, ulnar, and peroneal—were examined by Marchi, Weigert-Pal and hæmatoxylin methods. They showed slight Marchi degeneration, evidently of long standing, diminution in number of fibres, with marked increase in connective tissue. No evidence of any acute process was found, and the changes observed were regarded as secondary to the degeneration of ventral horn cells.

Anterior and posterior nerve roots: The changes observed in these roots may be summarized as follows: (1) Posterior roots—(a) engorgement of blood-vessels; (b) some degeneration by Marchi method, by no means intense, presence of fat granule cells containing fatty debris; (c) great diminution in fibres as revealed by Weigert-Pal method; (d) some proliferation of nuclei; (e) no great increase in fibrous tissue. (2) Anterior roots: Exhibited similar changes, but less in degree to those described for the posterior roots.

The Gasserian and Posterior Root Ganglia.

The pathological changes present in these ganglia were considerable and may be considered under the following headings:—

(1) Cell Changes.

(a) The nucleus often situated eccentrically and staining sometimes in a homogeneous manner.

(b) The nucleolus: As a rule the nucleolus is situated centrally in the nucleus but sometimes has taken up an eccentric position. In such cases the nuclear membrane may be seen bulging in front of the nucleolus. In a few instances the nucleolus seems to have been extruded from the nucleus, but it is difficult to recognize the extruded nucleolus among the round cells present within the ganglionic capsule.

(c) Cell protoplasm: This shows varying grades of chromatolytic degeneration. In some instances the cell is swollen and enlarged and the Nissl granules are in a fine powdery state. Some cells have undergone complete chromatolysis and then appear to have acquired acidophile properties, as the protoplasmic residuum has stained pink with eosin. Many of these cells exhibit vacuoles which have chiefly formed at the periphery of the cell, giving a fenestrated appearance to the cell margin. Other cells are shrunken and stain homogeneously. Some cells have undergone complete disintegration, their place being taken by the cells about to be described.

(2) Pericellular Changes.

(a) An increase in the fibrous tissue of the capsule and thickening of connective tissue stands between the ganglion cells.

(b) Proliferation of the endothelial cells of the capsule (fig. 8). This change, which occurs more markedly in the Gasserian ganglion than in the posterior root ganglia, though it is to be noted in these also, appears to follow degeneration of the cell. The proliferated cells invade the degenerating cell and finally replace it altogether, so that the contents of the capsule consist of cell collections which have originated in the manner described. The cells are of two types: (i) cells having small round nuclei like lymphocytes, which are probably derived from the connective tissue, and (ii) cells with larger nuclei, whose chromatin is arranged loosely within the nuclear membrane. These are undoubtedly

derived from endothelial cells of the capsule. Newly formed capillaries can be seen in connexion with many of these proliferated cell aggregations.

- (3) Blood-vessels are engorged, and in connexion with some of these a few scattered foci of small round-cell infiltration can be seen.

With regard to these changes within the capsule it is interesting to note that exactly similar changes have been recently described by

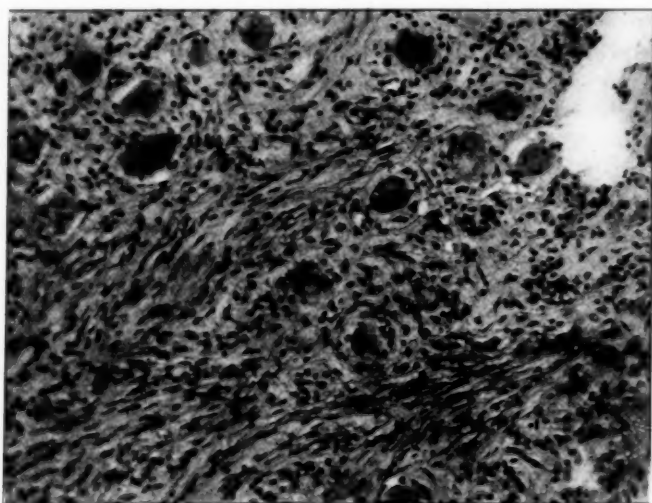


FIG. 8.

Gasserian ganglion (haematoxylin-eosin). Note chromatolysis in ganglion cells, proliferation of endothelial cells of capsule, with ultimate replacement of ganglion cells by these cells.

Jonnesco in connexion with two cases of infantile paralysis of long standing. In those cases the alterations of the posterior root ganglia were only found in the segments in which the ventral horn cells had been affected; elsewhere they were perfectly normal.

It would appear then that these changes are not necessarily part of the tabetic process which was present, but may simply be secondary to atrophy of the ventral horn cells of the spinal cord and the cells of the motor nucleus of the fifth nerve. However, I have found similar

changes, though not nearly to the same extent, in another case of tabes, and in a case of diphtheria. It may be that these proliferated changes in posterior root ganglia occur whenever the ganglionic cells degenerate, from whatever cause. It is well known that ventral horn cells exhibit chromatolytic changes after section of a posterior root, and it may well be that the cells in the posterior root ganglia which connect in the ordinary way with ventral horn cells may undergo degenerative changes when the corresponding ventral horn cells have disappeared or are seriously diseased.

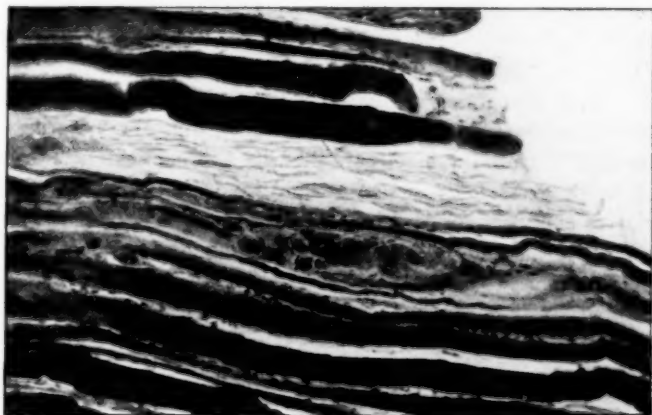


FIG. 9.

Longitudinal section, voluntary muscle (haematoxylin, Van Gieson). Note collection of cells, as described in text, replacing muscle fibre.

Muscles.

The following muscles were removed for examination: the tongue, the eye muscle, the diaphragm, the thenar muscles, the temporal, and tibialis anticus.

All the muscles showed similar changes, but they are least marked in the various ocular muscles examined. The latter appeared very little changed indeed, although completely paralysed for some time before death. The changes in the other muscles are practically identical with those found in progressive muscular atrophy. There is diminution in the size of the fibres which affects various fasciculi in different degree. The atrophied fibres still showed the transverse striation on longitudinal section. There is well-marked increase in the fibrous

tissue in connexion with the various atrophied muscle groups and marked increase in the number of nuclei present.

In the transverse section central nuclei were rarely seen, and central vacuolation of the muscle fibre not at all. The muscle spindles appeared unchanged and there was no degeneration of the intrafusal muscle fibre. In one or two of the sections a condition was observed which I have seen in one case of progressive muscular atrophy. At the periphery of the fibre and apparently invading the sarcoplasm a rather large oval cell, or group of cells, can be seen (fig. 9). These cells contain homogeneous staining cytoplasm and a well-marked, but rather small nucleus. They sometimes appear to be embedded within the muscle fibre which they have excavated before them. Dr. Gordon Holmes, to whom I showed the sections, informs me that he has found similar cells in cases of progressive muscular atrophy which he has examined. He referred me to Durante's article in Cornil and Ranvier's "Manual of Pathology." Here these cells are described in connexion with muscle changes in progressive muscular atrophy and they are regarded as a retrogressive condition of the sarcoplasm, after the myoplasm or contractile part of the muscle fibre has undergone atrophic change. It is, however, to be noted that Hayem has regarded these cells as evidence of attempted regeneration of the muscle fibre.

REMARKS ON THE CASE BY C. M. HINDS HOWELL.

Cases of muscular atrophy associated with tabes are, of course, common enough; indeed, Dejerine estimates that about 20 per cent. of tabetics exhibit it in some form or other. The types of muscular atrophy differ, and, as Wilson has pointed out, may be classified under three chief groups:—

- (1) Generalized muscular wasting occurring late in the disease.
- (2) Muscular atrophy of evident peripheral nerve origin.
- (3) A group of cases similar to that reported where clinically the disease appears to be of central nuclear origin.

Opinions have differed widely as to the nature of the lesions present, and even as to what part it is of the motor neurone on which the main incidence of the disease has fallen. The earliest case in which a pathological examination was made seems to have been that described by Charcot and Pierret, as long ago as 1871. In this case the muscular atrophy had a hemiplegic distribution, and the ventral horn cells on the corresponding side were found much atrophied. In this case

Charcot postulated spread of an inflammatory process from the posterior columns into the ventral horn of one side via the nerve fibres passing to ventral horn cells from the posterior columns. Observations by Leyden and Condoleon followed which strengthened the view that the condition was myelopathic, though Leyden regarded the condition as a second morbid process associated with tabes, and not as part of that disorder.

In 1888, Dejerine, as a result of nine autopsies, concluded that the muscular atrophy was due to a peripheral neuritis, since he found intense changes in the peripheral nerve, and little or no change in the anterior horn cells.

Cassirer and Schiff have recorded a case of tabes with hemiatrophy of the tongue, in which the twelfth nucleus was practically intact, muscular atrophy being due to peripheral changes in the nerve. Dejerine later admitted that in a few instances the changes in the anterior horn-cells were so pronounced that their significance in connexion with the muscular atrophy could not be excluded; but he then regarded the condition simply as an associated disease, and in no way part of the tabetic process. Schaffer, who has reported similar cases with definite cell changes, regards the pathogeny of such as due to absence of collateral connexions with posterior root fibres, coupled with an abnormal predisposition to degeneration on the part of the ventral horn cells.

From what has been said—and examples could-easily be multiplied—it seems clear that there are, at any rate, two pathological processes, either of which may be present—a central cell degeneration or a peripheral neuritis.

Examination of the case reported here shows it clearly to belong to the first group. The lesions in the peripheral and cranial nerves were slight as compared with the cell changes, and in our opinion were secondary to them. The meningeal inflammation in itself was insufficient to explain the cell changes, and the vascular disease was not very pronounced, and could not be regarded in any way as a probable cause of the cell degeneration. Further, the great loss of cells in Clarke's columns cannot be regarded as an example of *réaction à distance*, and serves to confirm the view we take as to the condition being primarily a cell atrophy. The changes in the muscle were obviously of a secondary character, practically identical with those found in progressive muscular atrophy. The pathological picture in this case differs little from what is found in cases of the latter

disease, the chief point of difference being that the cell changes are, perhaps, rather more acute. Also, in progressive muscular atrophy it is rare to find such widespread affection of the cranial nerves as was present in this case. We have been unable to find any case recorded in which quite such extensive lesions were present—at any rate, no case in which a pathological examination had been made. The nearest approach to it is one published by Dauwe and D'Hollander, in which tabes was associated with a bulbar paralysis with subsequent involvement of other cranial nerve nuclei and spinal grey matter. These observers attributed the cell degeneration in their case to failure of blood supply due to vascular disease, but at the same time did not entirely reject the idea of an anterior root neuritis. They give a large list of references at the end of their paper.

Having concluded in favour of a cell degeneration rather than a peripheral nerve lesion as the essential feature in this case, we must endeavour to ascertain the ætiological factor concerned.

Within the last few years a good many cases have been published under the title of syphilitic poliomyelitis. Some have been acute, some chronic. Such cases postulate primary cell degeneration due to syphilitic toxin. In further support of this view Marie and Léri, in their article in Bouchard and Brissaud's "*Traité de Médecine*," state that in their opinion syphilis is a very frequent cause of progressive muscular atrophy. They give as their reason for so thinking that in many cases of this kind a definite history of syphilis can be obtained and also quote the incidence of muscular atrophy in diseases which are known to be syphilitic, such as tabes and general paralysis. Their first reason is scarcely a good one; it may easily be a case of mistaking *post* for *propter*. Further, I have now examined in detail six cases of progressive muscular atrophy, and in no one of these was there any obvious evidence of syphilis either in the meninges or in the blood-vessels. Also in the series of cases examined by Dr. Gordon Holmes, and published in the *Review of Neurology*, no mention is made of any syphilitic lesion being present. When Dr. Wilfred Harris exhibited two cases at a clinical meeting of this Society in 1909, as examples of syphilitic poliomyelitis, the question was raised as to the exact nature of this disease. In what way, it was asked, did syphilis produce degeneration of nerve-cells? Was such degeneration to be regarded as primary or secondary to vascular disease? Dr. Harris in reply to these questions quoted a case with pathological examination published by Merle. In this case the condition present was not a primary cell degeneration such as our

case, and the two since reported by Wilson presented but a diffuse meningo-myelitis with perivascular sclerosis and apparently ischæmic cell degeneration, which is a much more definite syphilitic picture than is a primary cell degeneration. It is clear that direct evidence as to any causal connexion between syphilis and primary cell degeneration is very difficult to establish. It is, of course, very tempting to attribute the nerve degeneration present in cases such as these to a syphilitic toxin. Wilson does this in his interesting paper on two cases of tabetic amyotrophy, but arrives at this conclusion by a process of exclusion. For in his cases, as in ours, it was quite possible to exclude neuritis and any form of meningitis or vascular disease as cause of the cell degeneration. He remarks that there only remains syphilis, yet I would point out that all these factors mentioned may be excluded in most cases of progressive muscular atrophy; but certainly all such cases cannot be attributed to syphilis, though Wilson appears to agree with Marie and Léri's view on this matter.

Whenever possible, it is always best to postulate the presence of one rather than two diseases, but we must not be too readily convinced. If syphilis is the cause of the cell degeneration in such cases as these, and I do not deny the possibility of it being so, it seems rather strange that this type of case is not more commonly met with. Syphilitic disease of the central nervous system is common enough, yet these cases are, to say the least, decidedly uncommon. Also from the histological point of view the cell changes met with are not those usually associated with the action of any toxin. It is true that in this case a considerable number of cells in certain cranial nerve nuclei exhibit chromatolytic changes usually attributed to some toxic action, but the larger number show a more chronic degenerative change. Disease of the posterior roots cannot be invoked as an additional factor in the production of the ventral horn cell degeneration, as in the great majority of tabetics where that condition of course obtains, this type of muscular atrophy is absent.

One must not, however, forget the influence of the personal factor in determining the form that any particular disease or infection shall take. This is very well illustrated in the case of tabes itself. Not all those infected with syphilis later develop tabes. Syphilis is the pre-disposing influence, but other factors play, no doubt, a very important part in determining the onset of the disease. Of these the personal factor is by no means the least. It may well be, then, that there are certain individuals whose nerve-cells are so constituted that once exposed to syphilis they succumb to conditions which in the case of others prove innocuous.

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Dr. FARQUHAR BUZZARD said the case was a very interesting one, and it had been so fully described and discussed by the authors that but little more remained to be said. Dr. Howell laid stress on the changes in the posterior ganglion cells, and seemed to conclude that they might have some relation to the anterior horn cell changes. Looking at the illustrations and hearing what Dr. Howell said about those changes, it appeared to him that they were very similar to the cell changes described in the posterior ganglia after division of the posterior roots. He thought the description given of those changes, which occurred months after the division of the posterior root fibres—as against days in the case of division of the peripheral fibres—showed that they were rather of that type—i.e., they were generally associated with considerable thickening of the cell capsules and of the connective tissue fibres. It had also been shown, he believed, by some experimental observers that these posterior root cell changes were more severe when there had been division of both the posterior roots and the peripheral fibres. It struck him as being a possible explanation of the ganglion cell changes shown in this case, because evidently the posterior roots were, practically speaking, divided from a physiological point of view.

Case of Dermato-myositis in a Child, with Pathological Report.

By FREDERICK E. BATTEN, M.D.

INTRODUCTION.

DERMATO-MYOSITIS is a rare condition and especially so during child-life. I have been unable to find the record of any case of this disease in a child with full pathological examination.

Schüller has described a case of polymyositis in a boy aged 7, which followed on an attack of whooping-cough. The disease reached its acme in three weeks, and in eight weeks the boy was well. Schüller has collected five other reported cases of myositis occurring in children:—

- (1) Janicke's case, a girl, aged 3, a typical case of myositis fibrosa.
- (2) Schültze's case, a boy, aged 3, with eczema of the arms and atrophy of the muscles, designated dermatomyositis.
- (3) Kösters's case, a boy, aged 8, said to be an abortive case of dermatomyositis.
- (4) Cassirer's case, a girl, aged 6, with muscular atrophy. This case can hardly be accepted as a polymyositis as it was first seen two years after the acute onset.
- (5) Oppenheim's case, a boy, aged 8, in whom he diagnosed dermatomucoso-myositis, since there was an inflammatory condition of the mouth, gums and tongue, in addition to the skin and muscle affection. Four years later Oppenheim was inclined to regard the condition as a scleroderma.

None of these cases were fatal. Oppenheim records six other cases in adults, in two of which a fatal result occurred, but no autopsy was obtainable. The other cases recovered, some in part, others completely.

Petges and Clejat describe the case of a woman, aged 30, who was affected with dermatomyositis for eighteen months before her death. The skin showed atrophic sclerosis and there was general myositis. The connective tissue between the muscle fibres was most affected, and the authors regard the condition as an interstitial myositis with consecutive atrophy of the muscle fibres. They consider that the condition is probably of vascular origin. Three illustrations of the skin are given and one of the muscle; but the latter is not of much service for comparison with other sections of muscle.

Pathological Features.—The pathological features of dermatomyositis are described by Lorenz as a cell infiltration of the interstitial tissue with a degenerative condition of the muscle-fibre. The muscle fibres are in part destroyed by oedema, in part by a leucocytic infiltration. The infiltration is most marked in the region of the vessels.

Clinical Features.—The symptoms of a dermatomyositis may shortly be stated as follows: There is swelling of the extremities due to the inflammatory oedema of the subcutaneous tissue and muscles, acute pain, muscular rigidity, great tenderness on pressure, and an erythematous rash resembling erysipelas, situated over the affected muscle. The character of the rash may vary to a very great extent, it has been described as resembling urticaria, erythema nodosum, or purpura. The onset of the disease is gradual, there is a moderate rise of temperature, rigors are absent. When the acute stage passes off the skin is left in an indurated and inelastic condition, and the muscles are hard and contracted.

CLINICAL HISTORY.

R. H., aged 9½, was admitted into the Hospital for Sick Children, Great Ormond Street, on November 24, 1910, being transferred from the Metropolitan Hospital, where she had been for the previous seven and a half months under the care of Dr. Langdon Brown. She had first been seen by Dr. Brown as an out-patient and had been treated as such for six weeks, but as she did not improve she was, about the middle of March, 1910, admitted to the Metropolitan Hospital. When admitted, she had a well-marked erythema, distributed over the face, scalp, and extensor surfaces of the arms, hands, and legs below the knees. This was followed by very extensive scaling of the skin in these situations. In addition the skin, as distinct from the underlying tissue, was swollen, inelastic, hard, and with difficulty separated from the underlying tissue—i.e., it could not be picked up. This condition was most marked over the muscles of the thighs, buttocks, calves and lower part of the abdomen and back, but was present also over the triceps, shoulder-muscles and neck. When first admitted to the hospital she could walk a little, but gradually she became so stiff that she could not walk or sit up. Whilst in the Metropolitan Hospital there were periods of exacerbation of her disease, with acute swelling of the muscles and redness of the skin.

I first saw her in June, 1910, while she was still in the Metropolitan Hospital during one of these attacks, and suggested that she was suffering from dermatomyositis.

Patient was the first of five children, the second and third of whom had died of bronchopneumonia, whilst the fourth and fifth are alive and well. The father and mother are alive and apparently in good health, though the father was said to have Bright's disease. The father was a carman and lived with his family over a stable, where five horses were kept, and to these he attended. The entrance to the rooms was through the stable.

Patient was quite well till the beginning of 1910, when she had her tonsils and adenoids removed. She recovered from this and was well for three week. In February, 1910, she first complained of pain in the back, and on the following day the hands and arms were red and swollen. The legs then became swollen and were stiff and painful. During the time she was in the Metropolitan Hospital the temperature ran a slightly elevated course. Patient first came under my care in November, 1910. She was then in a somewhat wasted condition and lay stiffly on her back in bed, unable to move to either side (fig. 1). The neck was stiff and could only be turned a little to the right side, and not at all to the left, the back was stiff, the arms could not be raised above a right angle to the trunk, and the elbow could not be straightened beyond a right angle. The wrist moved well, but the fingers remained in a position with permanent flexion of the terminal phalanges. The hip- and knee-joints were stiff and flexed and could not be fully extended. Within a limited range all movements of the joints were free, that is to say, the elbow could be freely flexed and extended within the right angle, but at the right angle it was brought to a stop by the tension of the biceps muscle. Similarly with the legs, flexion was free, but extension was stopped suddenly by the tension of the hamstrings. There was no evidence of any swelling in or about the joints. The muscles generally were wasted, the biceps were firm and hard and the other muscles which could be palpated felt very firm. The muscles of the forearm were not flabby, but wasted and hard. The skin all over the body was thickened, and if an endeavour was made to pick up a piece of skin it was found to be greatly thickened and inelastic. The face was puffy, but was not oedematous. Physical examination of the nervous system was quite negative. The knee-jerks and ankle-jerks could not be obtained, but that was probably due to the contracted condition of the muscles. Nothing abnormal could be found in the heart, lungs or abdominal organs, and the superficial glands were normal. The urine was quite normal except on two occasions, January 6 and January 17, when the patient without pain passed

some blood-stained urine. Whilst in the hospital she had acute attacks of swelling of the muscles. In one of these the left adductor muscle became much swollen and hard and the skin over it red and inflamed. As this did not subside the swelling was explored by a needle and the fluid which was withdrawn examined both cytologically and bacteriologically. The fluid obtained was sterile and showed no special characters.

A series of examinations were now carried out. The blood was examined and showed no change. There was no eosinophilia. A von Pirquet reaction was done, with a negative result. The cerebrospinal fluid was examined and was normal. The blood was examined for a Wassermann reaction, with a negative result. X-ray photographs of the chest and muscles were made, with a negative result. No trichina could be found, and there was no evidence of myositis ossificans. Cultures were made from the blood, with an entirely negative result. The child had on two occasions passed blood in the urine. The examination of the urine showed the presence of blood-cells, no casts, and a motile bacillus. (The blood was subsequently accounted for by a stone in the ureter found at the post-mortem examination.) Sensation all over the skin was unaffected. The muscles showed a diminished electrical reaction, but no evidence of R.D. The temperature during the six months she was in the hospital never rose above 100° F., except on the two occasions on which blood and pus were found in the urine, and also at the termination, when it rose to 103° to 104° F.

Various forms of treatment were tried—salicylates, iodides, mercury, iodopin, fibrolysin, massage, warm baths, &c.—but nothing did any permanent good. Warm baths and massage seemed to improve her most. She preserved her intelligence till the end. She took and digested her food well, and she died from a coli infection arising from the bladder.

During the last six months of life the firmness of the muscles increased and she became much thinner. The abdominal muscles and also those of the back became very firm and tough. She lay with the arms and legs flexed in a half-sitting position. She died on May 21, fifteen months after the onset of her illness.

The post-mortem was performed by Dr. Frew. The body was emaciated, but the subcutaneous fat was present in fair quantity. The brain was not examined; the spinal cord appeared normal. The skin was firm and hard, and on macroscopical examination did not appear abnormal. The pleura and lungs were normal, except for a

slight congestion at the bases. The heart was normal. The liver was firm, and scattered over the surface, under the capsule, were numerous small, circular, pinpoint, yellowish areas, which could be shelled out from the surrounding liver tissue. On section through the liver similar areas were seen, some were larger and more irregular in shape, the largest being about $\frac{1}{8}$ in. in diameter. The spleen was not enlarged and appeared normal. Both kidneys appeared somewhat congested; the left ureter was dilated and its walls hypertrophied from the pelvis of the kidney to the point at which it crosses the line of the true pelvis, and here it was found to contain a small soft calculus. Below this the



FIG. 1.

Figure of child lying in bed, showing the wasted condition of the muscles and the greatest extent to which the arms and legs could be extended. (For this photograph I am indebted to Dr. B. Wainwright.)

ureter appeared normal. The bladder was not hypertrophied, but there were several submucous hæmorrhages. The suprarenal glands, the pancreas, stomach and intestines all appeared normal.

The microscopical examination of the skin and internal organs was carried out by Dr. Forbes, whilst that of the central nervous system and the muscles was carried out by myself. The liver showed universal congestion and scattered local areas of cells completely replaced by fat, more marked in the centre of lobules and under the capsule, but also occurring along the periphery of the lobules: the capsule was thickened.

The liver also showed cloudy swelling, and by the osmic acid method the fine fat globules could be easily discerned: the white areas visible to the naked eye were composed purely of fat. No tubercle bacilli or other organism or evidence of cystic parasites could be found in section or in film preparation from the minute nodules. The kidney showed an extensive area of congestion and cell infiltration of the interstitial tissue, most marked in the cortex under the capsule and becoming young connective tissue towards the medulla, causing considerable destruction to the normal renal tissue: the cells of some of the tubules showed fatty

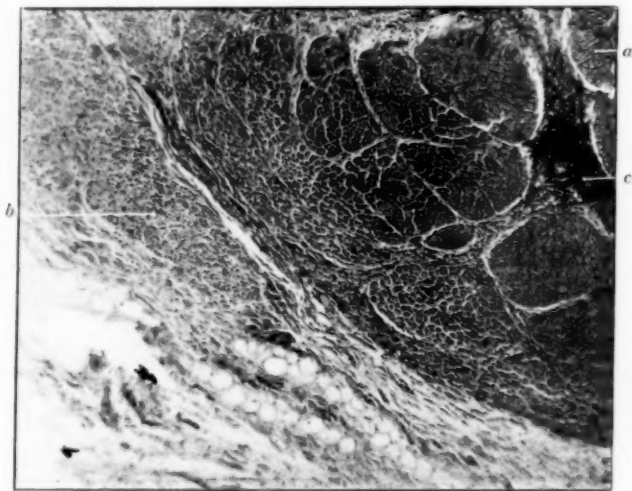


FIG. 2.

Transverse section of muscle showing: (a) normal muscle fibres towards the centre; (b) atrophied fibres towards the periphery; (c) a vessel the walls of which are infiltrated with lymphocytes.

changes. The heart-muscle appeared normal. The branches of the coronary artery in section showed thickening of the intima by organized fibrous tissue.

The skin on microscopical examination showed definite atrophic changes; the epidermis was reduced in thickness to layers of only two or three cells deep; the cells were stretched and flattened; there was also, in places, complete absence of papillæ. The amount of fat in the subcutaneous tissues was much reduced and largely replaced by fibrous tissue, which extended immediately up to the atrophied epidermis.

The subcutaneous tissue was poorly supplied with blood-vessels; the majority of those seen were completely occluded, showing in transverse section the appearance of small fibrous nodules; others showed hyaline degeneration of the vessel walls.

The examination of the spinal cord was carried out by the Marchi, Weigert-Pal, Van Gieson and Nissl methods, with a negative result. The median nerve was also examined and appeared normal. Several

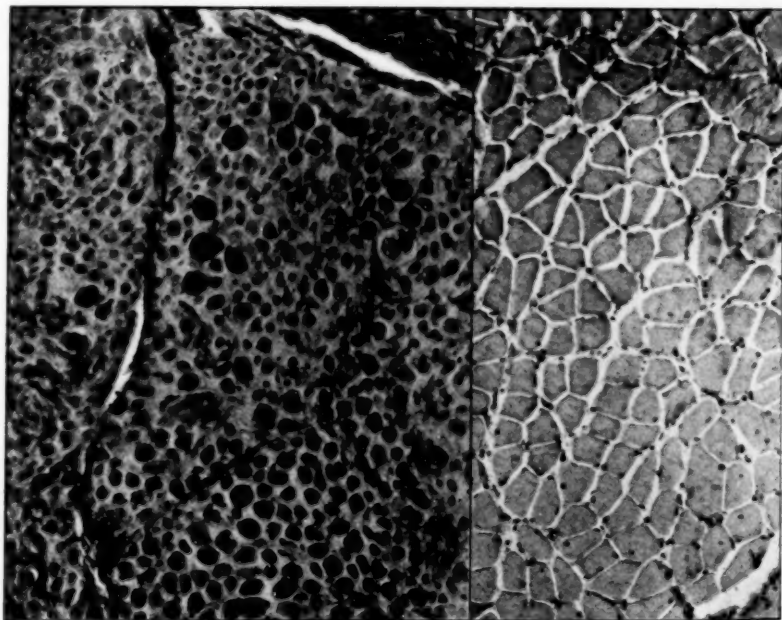


FIG. 3.

FIG. 4.

Fig. 3.—Section of peripheral portion of muscle, showing the marked atrophic condition of the fibres. It will be noted that in some parts the muscle fibres have almost disappeared, and the amount of interstitial tissue is small.

Fig. 4.—Normal portion of the same muscle photographed under the same magnification.

muscles were examined: the left biceps of the arm showed in its central portion well preserved muscle fibres of normal appearance and size; all round the periphery there was marked atrophy of the muscle fibres, and the nearer the periphery the more degenerate the fibres, so that in the outermost bundles practically no muscle fibres remained (fig. 2). The

peripheral portion of the muscle where it is covered by tendon did not show this atrophy, but at the points where the septa of the muscle ran in from the periphery the atrophy of the muscle fibres extended into the substance of the muscle. In the most peripheral portion of the muscle practically no muscle fibres were present, and the bundles were replaced by darkly stained nuclei, probably representative of the nuclei of the sheath of the muscle fibres (figs. 3 and 4). In some parts these nuclei have to a great extent disappeared, and all that remained was connective tissue with a few nuclei. At certain spots, generally in close relation to vessels,

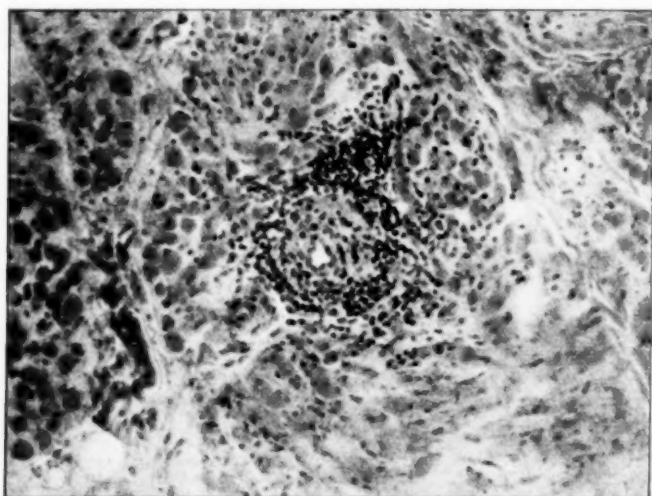


FIG. 5.

Section of vessel showing lymphocytic infiltration of the walls of the vessel and the surrounding tissues. The vessel wall is thickened.

there were accumulations of small round cells (lymphocytes) (fig. 5). These cells were more frequent around the veins than around the arteries; sometimes they lay in the muscle apparently quite away from the neighbourhood of the vessel. The adductor muscles of the thigh showed the same change, only in a more marked degree, and the change was not so limited to the peripheral portion of the muscle, the inflammatory process extended inwards, along the septa between the muscle bundles to a greater extent than in the biceps. The rectus abdominis showed similar change, the superficial layers of the muscle fibres being affected,

whilst the deep layers escaped. The left rectus femoris showed less change. The biceps femoris, again, showed more atrophy of the same kind as has been described in the other muscles; the perivascular exudation was well seen around the vessels. The erector spinæ muscles showed little or no change; the left triceps showed a degree of atrophy similar to that of the biceps; the pectoralis major muscle was relatively well preserved; the diaphragm on the whole was well preserved, but some bundles of muscle near the surface showed a moderate amount of fibrosis (fig. 6).

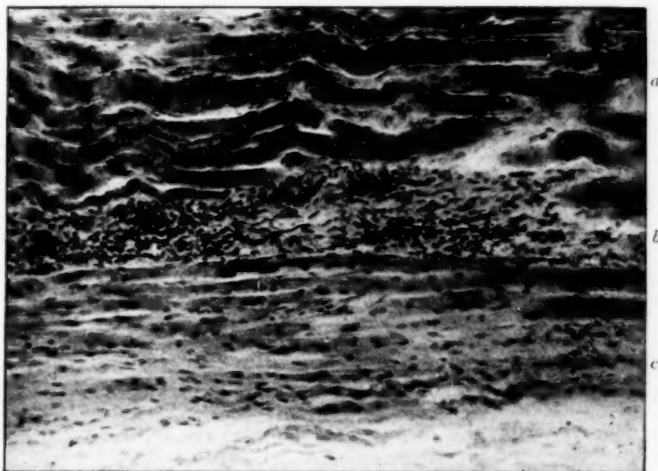


FIG. 6.

Longitudinal section of muscle showing: (a) normal muscle fibres; (b) infiltrated vessel wall; (c) various degrees of atrophy of muscle fibres.

Vessels: The walls of the arteries were greatly thickened, some of the vessels were surrounded by small round cells, and in others the lumen of the vessels was entirely obliterated, and the vessels obviously occluded. In all the vessels examined there was an undue thickening of the coats.

COMMENTARY.

There are various points in the above case which call for comment. The diagnosis dermatomyositis was based partly on positive signs and partly on the absence of evidence of affection of organs other than the skin and muscles. The positive signs were the character of the affection

of the skin, the concomitant affection of the subjacent muscles, the periodic attacks of acute swelling of muscles and redness of the skin, and the subsequent induration of the skin and muscles after the subsidence of the acute attacks.

The negative signs were the absence of any evidence of affection of the joints, of the blood, of the viscera, or of the nervous system, and in addition to these the absence of any sign of syphilis, tubercle, *Trichinella spiralis*, and any form of organism capable of being cultivated on the ordinary media.

The diagnosis was confirmed by both macroscopic and microscopic examination in that no evidence of any disease of the visceral organs (except such slight changes as have already been mentioned in the substance of the paper) or of the nervous system was found, and the changes found were limited to the skin, subcutaneous tissues and muscles.

The most striking point with regard to the changes in the muscles is that it is the superficial portion of the muscles which have suffered, whilst the deeper portion of the muscles have escaped.

Those parts of the muscles which are separated from the subcutaneous tissues by a thick tendinous sheath escape affection, whilst those muscle fibres which lie in close contact with the subcutaneous tissues and along the intermuscular septa are liable to be affected.

The perivascular infiltration of the vessels with small round cells is a striking feature, as is also the thickening of the walls of the vessels and in some cases the actual obliteration of the vessels.

The infiltration of the muscle fibres with lymphocytes also occurs, and gives rise to the occurrence of "lymphorrhages." These occur for the most part in close connexion with the vessels, but a few such lymphorrhages can be found which do not appear to have any direct connexion with the vessels.

The change in the muscle would seem to be due partly to oedema and partly to the cutting off of the blood supply to the fibres—the amount of interstitial tissue between the fibres is small when compared to that found in such a condition as myopathy.

CONCLUSION.

There is no doubt that the case belongs to the condition described under the name "dermato-myositis." What the cause of this condition may be has yet to be proved. It seems certain that the present case

was not due to syphilis, tubercle, *Trichinella spiralis*, or any known microbial infection, but probably was due to some toxin of exogenous origin. This toxin may be of such a character that it can only be discovered by animal inoculation. Cases of dermato-myositis are rare; but should further opportunity arise an endeavour will be made to investigate the nature of such cases by the inoculation of animals. The fact that this child lived in close proximity to horses rather suggests that the infection may be conveyed from these animals.

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DISCUSSION.

The CHAIRMAN (Dr. H. H. Tooth) said the paper was a very interesting one. He would be glad to know whether any bacteriological cultures had been made from the case. It seemed very much like an infection from without.

Dr. F. PARKES WEBER said that Dr. Batten's case was apparently not an absolutely isolated one, but it seemed to form one of a group, which group remained still to be carefully differentiated. The only cases in adults which seemed to correspond at all to the case of the child described by Dr. Batten were those in which there was a deep sclerodermia, not a sclerodermia of the superficial "morphœa" kind, but a sclerodermia affecting the subcutaneous tissue as well as the skin, the muscles likewise occasionally feeling hard. In these adult cases, as far as he knew, the extremities were usually the only parts affected, especially the hand and forearm; whereas in Dr. Batten's case the changes affected the trunk and limbs.

Dr. LANGDON BROWN said that when he first saw the child there was marked œdema of the face, forearms and hands, and on the œdema there was superposed an erythematous eruption. This was all that could be found on careful examination by ordinary methods. Then the muscle pains began, and at that stage he thought it would prove to be one of the skin conditions associated with rheumatism. But it soon became clear that it would not fit into that group, because of the marked invasion of the muscles. After the

acute stage had apparently settled down there was another "flare-up" in the adductor group of muscles in the left thigh, those muscles becoming of extraordinary board-like hardness. The large rounded masses which Dr. Batten described as being almost certainly thickenings of blood-vessels were very prominent in certain parts of the muscle excised during life. He believed they had been described by other observers as occurring in this condition. In fact, one account which he read said these large rounded masses might be confused with *Trichina spiralis*. The differential blood count showed nothing abnormal at that time. He had two blood cultures made, but they proved sterile.

Dr. GRAINGER STEWART asked if there was any periodicity in the occurrence of the attacks.

Dr. BATTEN, in reply, said bacteriological examinations of the blood, fluid obtained from muscle puncture, and cerebrospinal fluid, all met with a negative result. He had asked Sir John MacFadyean, the greatest authority on veterinary medicine, to see the child, but he knew of no similar condition as occurring in horses. There was no periodicity in the attacks, they were quite irregular. Neither were the attacks always attended by a rise of temperature.

Neurological Section.

February 15, 1911.

Dr. H. H. TOOTH, C.M.G., Vice-President of the Section, in the Chair.

Two Cases of Spontaneous Hæmatorrhachis, or Intrameningeal Spinal Hæmorrhage—one cured by Laminectomy.

By WILFRED HARRIS, M.D.

IN the article on intraspinal hæmorrhage by Russell in the last edition of Allbutt and Rolleston, it is stated that spontaneous non-traumatic hæmorrhage within the spinal meninges is very rare, and its mode of origin uncertain, and that probably some of the cases are due to strain. As far as I can remember I have seen only two cases of this condition, both in the same week last December, one seen in consultation for workmen's compensation, the other in private practice.

Case I.—F. G., aged 36, electric linesman on a tramway, seen December 13, 1911. History: On August 16, 1910, sixteen months ago, he was engaged pushing a broken-down van off a tram-line; he was in a stooping position grasping two spokes of the front wheel, and as he made his effort his right leg slipped backwards and he fell over on to his left side, at the same moment feeling a sharp stabbing pain in the middle of the lumbar region, making him cry out. He got up at once and noticed the pain was spreading down the front of the right thigh as far as the knee, this continuing for twenty minutes. He was driven back to the depôt, the pain then being only in his back, not in the leg, and two hours later he returned home by car and walking a few hundred yards, the pain in his back continuing all the time. He went to bed at once, the pain then increasing in severity, being like a knife in his back and aching down the front of the thigh. He hardly slept all night for the pain, and ever since then the pain in the back and thigh has been continuous, often keeping him awake at night. As he was slightly better three weeks after his accident he struggled back to work for a few days, but as the pain increased so much he had to give it up again. Since that time he has lived

continuously in hospitals or in the infirmary. Four months ago the pain spread to the front of his left thigh, though less severe than the right. He has never been unable to stand, but cannot walk more than a step or two with difficulty, and he says his legs have wasted, especially the right thigh. No bladder weakness, but is constipated. Has lost 2 st. in weight. A month ago he lost power gradually in both feet.

On examination, December 13, 1911, could just stand, spine very rigid and immobile except the neck, the erector spinæ standing out strongly on both sides. In bed he cannot lie flat with comfort, preferring to sit propped up; he can just raise his right thigh and leg off the bed, the left somewhat stronger. Right thigh measures $\frac{3}{4}$ in. less than the left. There was scarcely any power of movement of either ankle or toes. The right thigh, leg, and foot were constantly bathed in sweat; no pain on movement of either hip or knee. Sensation normal everywhere to light touch and pin-prick. Can sleep only in snatches, sitting up in bed, on account of pain. Reflexes: Knee-jerks absent, Achilles-jerks absent, plantar reflexes absent. Lumbar puncture in the fourth space yielded 2 c.c. orange-coloured clear fluid. This gave a positive reaction to Gmelin's test for bile-pigment, but was said to contain no altered blood-pigment. Electrical reactions in all muscles of the legs and feet and thighs were practically normal.

The history of severe onset of sudden pain in the back and thigh, following a severe muscular effort, the pain being so severe as to keep him awake and lasting for days, is sufficiently suggestive of a diagnosis of meningeal hæmorrhage. The continuance of the symptoms until I saw him sixteen months later, with the signs I have just described of wasting of the thigh, loss of all the deep and superficial reflexes in the lower extremities, with rigidity of the back and absence of sphincter involvement, I considered made the diagnosis of intrameningeal lumbar hæmorrhage followed by chronic meningitis absolutely certain. The orange colour of the fluid obtained on lumbar puncture was also suggestive of altered blood-pigment. The absence of sphincter involvement suggested that the site of the hæmorrhage was below the termination of the cord amongst the lumbar and the sacral roots.

Acting on this diagnosis I asked Mr. Clayton Greene to perform a lumbar laminectomy in the hope that the organized clot might be found, and thus relieve pressure on the roots. This was accordingly done on January 4, the neural arches of the twelfth dorsal and first and second lumbar vertebræ being removed. The spinal theca was seen to be tense, with no pulsation. On incising it longitudinally it was found that the nerve-roots were closely pressed against and adherent to the dura mater on all sides, and lying in the centre of the canal, surrounded by the nerve-roots, appeared a purplish mass about 5 in. in length, of

smooth surface and cystic in one part; the cyst burst, about $\frac{1}{2}$ oz. of yellowish fluid escaping, and the general shape and appearance of the mass may be said to have resembled a large garden slug. This shelled out without any difficulty, with the exception that one root had to be divided owing to being involved in the mass, and two others were also badly damaged in the process of separating them from the dura to which they were adherent. The man recovered well from the operation, although for the first twenty-four hours there was considerable abdominal distension and collapse. His temperature remained normal. As a result of the operation the pain of which he formerly complained in the back and thighs disappeared completely, and he was at once able to lie on his back or side with comfort. Considerable anæsthesia was present at first on the dorsum of the right foot and toes, extending about 4 in. above the ankle. This has diminished in intensity slightly since the operation, and though light touches and pin-pricks are not felt on the dorsum of the right foot and ankle, strong pricks are now felt distinctly on the dorsum of the foot. On the sole of the right foot sensation is dulled, and is less acute than on the left foot. By the end of the first week after the operation the left knee-jerk had returned, but the right knee-jerk and both the Achilles-jerks are still absent, and taking into consideration this fact with the marked anæsthesia of the foot, it seems to me probable that the roots which were divided were the right fourth and fifth lumbar and the first sacral, though there was nothing to indicate at the time of the operation which particular roots were divided. The man has steadily improved, and can now move his left foot and toes practically normally. He can also move his right foot strongly, but feels uncertain of it, probably owing to the anæsthesia. He can now just walk alone a few steps, though the anæsthesia of the right foot makes him feel liable to fall. The sweating of the right foot and leg, which was a prominent symptom before the operation, has now disappeared entirely, and he has now no pain at all.

Case II.—Mr. S., aged 37, when hunting on November 28, 1911, was galloping down hill when he suddenly felt a blow on the nape of his neck as though struck by a stone, or by someone, and he looked round to see if anything could have hit him; the pain became worse every minute, and he found he could not bend his head forward, but could turn it from side to side, and the pain was relieved by throwing the head backwards. He felt intense nausea and giddiness, with frequent retching, and his eyesight seemed blurred; he got off his horse and found he could stand, but lay down on the heather for ten minutes. His wife, who was with him, said he turned very white.

After ten minutes his colour had improved, though he felt no better, but he mounted again and managed to struggle home at a walking pace, taking two hours, feeling an intense pulsating pain from the back of his neck into the back of his head all the time. After reaching home he vomited once, and the pain in the neck and head was intense until 10 p.m., when a poultice to the neck and some 'tabloids' his doctor gave him relieved him somewhat. He slept only one hour that night owing to pain. For two days the pain was severe and continuous, preventing him from bending the head forward. After that time the pain spread down round the lower half of the body and into both legs down to the ends of his toes, being worse on movement. He could scarcely walk and would sometimes collapse with the pain. No pain at all in his arms and shoulders. The pain has since gradually diminished, so that when I saw him on December 19 last he was practically free from headache, except for about half an hour daily around 6 p.m. He then had the pain in his legs only if he stooped right down, and only at the back of the hip and thigh. He could not reach within 6 in. of his toes on stooping, though formerly he was quite lissom, and able to touch the ground, keeping his knees straight.

Physical examination, *nil*. All reflexes, motor power, and sensation normal. There is no albumin or sugar.

Previous history: Four years ago he had lead colic from his water supply, and only just escaped being operated upon for supposed duodenal ulcer. This was recognized only through his butler developing a dropped wrist. No venereal disease.

I have included this case with the other, as it is a case of spontaneous intrameningeal hæmorrhage without doubt. As three weeks had elapsed when I saw the patient, and he was so much better, I did not feel justified in performing a lumbar puncture. In this case the vessel that ruptured was probably in the posterior fossa or near the foramen magnum, the subsequent root pains round the trunk and lower extremities being due to irritation from the blood carried downwards to the cauda equina by the cerebrospinal fluid. Fortunately in his case the blood seems to be absorbing, without causing pressure symptoms from a clot, and without setting up a meningitis.

The symptomatology of spontaneous cerebral intrameningeal hæmorrhage has of late years been fully described by several French physicians, Chauffard, Froin, Follet and Chevrel, Roy and Lévy, and others. They have shown that the conditions can be recognized by lumbar puncture, and that though the onset is sudden, with intense pain in the head, vomiting, perhaps loss of consciousness and slight pyrexia, the prognosis is good in the large majority of cases. Cerebrospinal fluid obtained by early puncture is deeply blood-stained, though it does not clot, and after four days the fluid after centrifuging is found stained yellow, and gives the reaction of bile-pigment by Gmelin's test.

In my first case the hæmorrhage was obviously low down in the spinal canal, and such seems to be far rarer. Oppenheim, indeed, in his text-book on nervous diseases, refers only to the traumatic form of intrameningeal spinal hæmorrhage. In this case the blood clotted in situ and acted like a tumour or foreign body, unlike that which spreads down in the cerebrospinal fluid from an intracranial meningeal hæmorrhage, as in my second case, in which the coagulating power is practically lost. This last point will help in differentiating blood mixed with cerebrospinal fluid due to puncture of a vein by the needle in the operation of lumbar puncture. When this slight accident occurs, the blood is incompletely mixed with the cerebrospinal fluid, and soon clots.

In a case which I have seen recently, that of a man who fell over 40 ft. in a sitting posture, producing immediate flaccid paraplegia and complete sphincter palsy, with deep anæsthesia of the second, third and fourth sacral areas, and lighter anæsthesia up to the first lumbar, there is probably hæmorrhage into the sacral segments of the cord as well as intrameningeal spinal hæmorrhage. Two weeks later by lumbar puncture I obtained a clear orange-coloured liquid, no free blood, but yet giving a thick yellow clot on standing, the fluid giving positive reaction for bile-pigment.

DISCUSSION.

The CHAIRMAN (Dr. H. H. Tooth, C.M.G.) said he assumed that hæmorrhages into the substance of the cord were fairly common; he remembered having seen quite a number of them. Hæmorrhages into the theca seemed to be less common and less easily diagnosed, and therefore members would be grateful to Dr. Harris for having brought a well reported case of the kind before the Section.

Dr. F. E. BATTEN said there were one or two very interesting points about the first case. The patient had improved for a time, and then his symptoms progressed; that is to say, after the immediate effects of traumatism had passed away the nervous symptoms progressed. One would expect that after the immediate effect of the trauma had passed away the nervous symptoms would not have been progressive. He had himself seen a case in which the symptoms after a traumatism had been slowly progressive, but they were progressive from the time of the traumatism; it was a case of hæmorrhage outside the theca. With regard to the yellow-coloured fluid obtained on lumbar puncture, he asked whether it had given the ordinary blood test. [Dr. HARRIS: No.] That was extraordinary, because it seemed likely to be blood. He had seen not a few cerebrospinal fluids with this yellow colour,

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and the pathologists had told him that it was not blood, but he did not know to what it was due. He had seen it in tuberculous meningitis, and also once in a case of intracranial tumour.

The CHAIRMAN said another interesting point in connexion with the case was that it was known that at least one, and probably more, roots had been damaged, and yet the involved area of altered sensation did not correspond to a proper root of any kind. Only a small part of what most recognized as the fifth lumbar area was affected, and it raised the question whether, after all, it was possible—which he did not think it was—for the posterior roots which had been damaged to regenerate. If it were a fact that three roots were cut, the patient did not present the complete picture of an anaesthesia proper to any of the three roots. It was not often one got the opportunity of performing on the human being the same operation which many had carried out on monkeys—namely, section of posterior roots. The great overlap in monkeys was well known: was there a similar overlap in man? It seemed that there was.

Dr. GRAINGER STEWART, in reference to Dr. Batten's statement about the delayed effect of injuries, remarked that he had a patient who, in August last year, when swinging from a beam, fell, and hoping to avoid hitting his head, bent it forward and struck the floor with the upper dorsal part of his back. Immediately afterwards he felt ill, but did not vomit. He was helped up by his companions, found he could stand, and was assisted to walk home; he was not paralysed, but felt shaky and faint. He was driven twenty miles in a motor, and that night he could not pass his water, though next day he could do so normally. He had no sensory loss and no paralysis, but had great pain in the back, which was attributed to the bruising where he struck himself. Although he had great tenderness of his back when he lay on it or when anyone pressed it, there was also an uncomfortable sensation round the left side of his chest coming round to slightly above, but mostly below, the nipple. He was told to remain in bed and to keep quiet for a day or two; but he was allowed up to micturate, so the rest was not absolute. Four days later, while lying in bed, he suddenly felt a pain on the outer side of his right leg, followed by numbness, not limited to the distribution of the pain, but over the whole of the leg, with sensations of pins and needles below the knee. When he tried to move the leg it was very weak, that weakness having come on five or six days after the accident. With regard to the cord symptoms, he had no loss of sensation, but there was spastic weakness of the right leg and increase in all the deep reflexes, and extensor response. The epigastric and abdominal reflexes were absent. The weakness was much greater in the peronei of the right leg than in any other group of muscles, so much so that he wondered whether the patient had had some hæmorrhage which had tracked down and injured his fifth lumbar root, or had sustained two injuries to his cord. An X-ray picture showed the lumbar region to be normal. There was no sensory loss over the fifth lumbar root area, and the muscles reacted

well when tested electrically. With regard to the local symptoms, he had definite pain in the fifth dorsal root area on pressure over the fifth dorsal spine, but on testing he could not find any definite loss of sensibility, although he did not give quite such correct answers as he did when tested elsewhere. X-rays showed a fracture of the body and lamina of the fifth dorsal vertebra, with displacement of the transverse processes, on the right side downwards and on the left upwards. His doctor thought he had got worse, but the patient thought his worst time was immediately after the onset of the paralysis. He thought the man was not suffering from a lesion inside the cord due to anything which occurred at the time of the accident, but that he had pressure on his fifth left dorsal posterior root, and some pressure on the right side of the cord. In another case a patient had a lesion high in the upper dorsal region, with symptoms of intramedullary injury to the cord, and at the time severe pain in the lower sacral region. He had no symptoms of sphincter trouble, but in three or four weeks he developed definite signs of loss of sphincter control, and loss of sensation there. He did not doubt that blood had tracked down to the cauda equina, and that there was a clot formed there, with pressure on the roots, and a secondary lesion later on. He thought it was a great question whether, in these cases, one should not operate, not only on the site of the lesion, but low down to relieve the secondary trouble. He had once performed a post-mortem on a case at Queen Square Hospital, in which there was a lesion high up, and secondary symptoms due to hæmorrhage pressing on the sacral roots.

Dr. WILFRED HARRIS, in reply, thanked Dr. Batten for his remarks. He thought Dr. Batten's case and his own were produced in different ways. He imagined Dr. Batten would agree that in his the progress of the symptoms was due to slow compression of the cord as a result of the hæmorrhage. But in his own patient he thought it was as follows: that the sudden onset of intense agony, which persisted, was due to the intrameningeal hæmorrhage amongst the roots of the cauda equina. In three weeks he had slowly got somewhat better, so that he was able to struggle back to work. After being at work four days he became so bad that he had to give up, and his condition thereafter became worse. He ascribed that to meningitis having been set up by the hæmorrhage, and perhaps aggravated, if not indeed started, by the fact of his not lying up long enough but going back to work. At the operation it was clear that there had been fairly well marked meningitis, the roots being glued up against the dura so that they could not be stripped off, and were nipped with the dura. He also was informed by the chemical pathologist that the yellow fluid contained no altered blood-pigment. He then tested the cerebrospinal fluid with nitric acid for Gmelin's reaction of bile-pigment, and it yielded a moderately brilliant green, but not the usual full play of colours. Froin, in 1903, first drew attention to the alteration of the blood-pigment in the cerebrospinal fluid, and it had been shown that after the fourth day of the hæmorrhage bile-pigment began to appear. He had not seen any reference to this in

English literature. Stress had been laid on the question of clotting, and it was said that that was a point of distinction from any accidental blood contamination from the actual lumbar puncture, that the blood which came out of the needle as the result of previous intrameningeal hæmorrhage would not clot after being withdrawn, whereas that from puncture of a vein did clot. He himself did not believe that was an absolute point of diagnosis if the intrameningeal hæmorrhage was low down. The sample of cerebrospinal fluid he now showed was from a man in St. Mary's Hospital who, during the recent frosty days, was working on a roof mending a broken pipe, and fell, he said, over 40 ft. In falling he drew up his legs to try to save his head and fell in a sitting posture on to his buttock. He did not lose consciousness, but he instantly felt a numb sensation on his legs and rolled over on his side. When admitted a fortnight ago he had total flaccid paralysis of his legs and moderately deep anæsthesia to the groins, with dense anæsthesia of the buttocks and genitals. The anæsthesia to the groins had now almost faded away, so that he could now feel on his feet and legs. He still had dense anæsthesia over the second, third, and fourth sacral segments, with incontinence, and anæsthesia of his sphincters. He judged therefore that the man had a spinal as well as an intrameningeal hæmorrhage. In the case of the man described in his paper it was sixteen months before he saw him after his accident, and that might account for the extreme alteration of the blood-pigment. How the cerebrospinal fluid acted upon blood to produce bile-pigment he could not tell. The Chairman's remarks about anæsthesia, and on the question of regeneration of posterior root fibres were very interesting. He believed it was agreed that there was no such thing as regeneration of a posterior root fibre within the spinal cord. So he thought possibly some fibres escaped in the root which was only pinched; two roots were cut and one was pinched. He thought the fact that a definite root area was not shown was due to overlapping; in fact, he was surprised that such dense anæsthesia was shown. In a case in which he had divided the third, fourth and fifth lumbar roots for a man who had had pain of thirty years' duration, after the operation there was only slight anæsthesia on the outside of the leg. With regard to Dr. Grainger Stewart's case, he suggested that laminectomy might relieve the patient. If he did a lumbar puncture it would be interesting to know what was the condition of the cerebrospinal fluid.

The Vestibule and the Perception of Space.

By F. L. GOLLA, M.D.

THIS paper represents an attempt to give some indication as to the part that vestibular sensations may be supposed to play in the mechanism by which space is perceived. Two lines of inquiry are at our disposal: the study of the effects of excitation of the vestibular apparatus on spatial perception, and the study of the effects of destruction.

The first method permits of treatment in two ways: the vestibule may be experimentally excited, or the effects of pathological irritation may be studied. The experimental excitation of the labyrinth may be effected either by the galvanic current, by the temperature method that has been popularized by Bárány, or by rotation. The two first methods are of little service for the purpose under consideration, as they neither admit of determination of the plane in which vestibular stimulation is to take place. Hence the method of excitation by rotation has been alone adopted, and the visual factor eliminated by performing all the experiments on blindfolded patients.

As is well known, rotation on a turning stool is followed on its cessation by a subjective sense of rotation in the opposite direction. This subjective sense of rotation, or after-effect, is felt with much greater intensity than the original movement, of which only the initial positive and final negative changes of angular velocity are really appreciable. When the subject is in the erect position, the head being suitably fixed so that the axis of the revolving seat passes through the long axis of his body, the after-effect on cessation of rotation appears to be in the horizontal plane. When the subject is shifted slightly in his seat and the head inclined laterally till the axis of the chair passes through both ears, it will be found that, supposing the right ear to have been uppermost, the after-effect on rotating the stool in the clockwise direction has the apparent direction of a downward movement on the part of the body, and on rotating the chair anticlockwise the after-effect represents an upward movement. With the left ear uppermost, the relations of upward and downward sensations to the direction of rotation are reversed. These after-sensations are much more disagreeable than

those elicited in the horizontal plane, and if care be not exercised the patient will fall out of the chair during the attack of vertigo. If the head be inclined at an angle midway between the vertical and the lateral positions, the after-sensation is a combination of upward and lateral, or of downward and lateral subjective movement, according to the side towards which the head is inclined and the direction of rotation of the chair.

It is not necessary to discuss here the cause of these after-effects at any length. I regard them as having nothing in common with the negative after-image which can be produced by visual stimulation. They are of greater intensity than the original sensation, the only consciousness of which we obtain, providing the chair be on frictionless bearings, at the moment of the initial acceleration of angular velocity, and the final negative acceleration when the chair is stopped. During rotation the subject is frequently unconscious of any motion, and asks the operator if the chair has stopped. Without entering into a discussion of theories of vestibular action, it would appear as if the after-sensation were due to a disturbance of the normal relation between position of the head and vestibular sensation due to a dislocation through the previous rotation of the stimulating forces in the ampulla. Whilst, however, we are unconscious of movement during rotation, I think that in the light of the experiments of Stein, on the apparent displacement of the vertical during rotation in a closed box there can be no doubt that excitation of the labyrinth which does not reach the limen of consciousness is proceeding throughout rotation. The accuracy with which the extent of rotation through a small angle is judged with closed eyes is another point in favour of this view.

The chair used for the experiments (*see figure*) was made in the physiological laboratory of the University of London, where the majority of the experiments here detailed were conducted. It was mounted on practically frictionless ball bearings and provided with a movable clamp for fixing the head in any desired position. It could be propelled with fair accuracy by hand, but in the later experiments a small electric motor sufficiently powerful to start the chair at once at the desired speed was used. By this means alterations in the angular velocity during the rotation were avoided. I have not endeavoured, on account of the great experimental difficulties, to produce after-effects by checking movement in the straight line. That such after-effects occur, though only of

momentary duration, was noted by Abels¹ as a slight negative subjective movement when a train is rapidly stopped. I can confirm this from personal observation, but these after-effects are of very feeble intensity and rapidly suppressed, presumably owing to long-acquired habit, much as the ballet dancer learns to suppress the vertigo from pirouetting. In the vertical plane Mach² obtained some doubtful after-effects of momentary duration, experimenting with an apparatus resembling a



Rotating chair with screen fixed in position for projection.

large Attwood machine. Had he, instead of this, made a descent by the lift of a fairly deep coal-mine, he would have had no doubts as to the reality of the negative after-effect, which is of considerable intensity and duration.

¹ Abels, "Nachempfindung im Gebiete des kinästhetischen statischen Sinnes," *Zeitschr. f. Psychol.*, Leipzig, 1906, xlii, 1 Abt., pp. 268-83.

² E. Mach, "Grundlinien der Lehre von der Bewegungsempfindungen," Leipzig, 1875.

In order to determine the knowledge of the spatial relations of the area immediately surrounding the body, the subject was placed with his eyes shut before a screen of paper ruled in millimetre squares. After being allowed to look at the screen he was then told to close his eyes and imagine his image projected on the screen as in a mirror and to touch with his forefinger a point on the imaginary image corresponding to a point touched on his person by the observer. The points indicated by him on the paper screen were marked with a pencil, and their relation to the spot on the screen really opposite to that touched on the body of the subject was noted. In order to bring all the ideal corresponding areas to be touched on the screen within easy reach of the arm, only the areas opposite to the face, thorax, and upper portion of the abdomen were investigated. A large number of normal people were examined, and the results obtained show curious variations in the accuracy of projection. The mid-line was invariably indicated with great accuracy. It would appear that the mesial plane of space is the only one that is accurately known. The projection of parts of the body touched laterally to the mid-line differed to a great degree in various subjects. Thus the distance between the two eyes was recorded by different subjects as being between 8 cm. to 30 cm. In other words, some subjects represented the face as subtending two or even three times the area projected by others on the screen. In all cases the two sides of the face or body were fairly symmetrically recorded, and the fact that the same spot touched at intervals was recorded on the screen with but little deviation from the original projection suggests that the variations are due to different conceptions of the area of space subtended and not by deficient muscular sense. The size of the projected image does not appear to bear any direct relation to the distance of the screen from the subject, though when the screen was removed to nearly full arm's length the accuracy of the projection was, as might be expected, considerably impaired.

The subject was now seated on the rotating chair, and the screen clamped in front of him to the two arms of the chair. With the eyes closed the points on the face touched were projected on the screen. The head was fixed in position by the clamp and the chair rotated in one or other direction at uniform speed. After thirty revolutions with an angular velocity of about 360° per five seconds, the chair was stopped, and the spots previously projected were again touched and the patient asked to project them on the screen. Naturally, after cessa-

tion of the rotation the negative after-vertigo set in. The subject now localized the points touched on the screen towards the side from which he had been rotated, and in extreme cases the error was as much as 3 ft. from the true. Gradually, as the vertigo passed off, the projection approached more and more to the true position, and in a few cases after coinciding with the pre-rotatory localization a positive after-effect appeared, and the projection was carried for a short time slightly over to the side towards which the subject had been rotated.

Now since vision does not enter into consideration, the only other sensory factors that could be responsible for the erroneous projection are the muscular sense and the vestibule from which the vertigo has origin. That the muscular sense was unimpaired could easily be shown by asking the patient to touch on his own person any spot previously touched by the observer, and in no case was any abnormality in the shape of sensory ataxy observed after rotation. The subject was therefore aware of the position of his head in relation to his hands, but his notion of the relation of external space to his body had been disturbed, and the direction of the disturbance was determined by the mode of stimulation of his vestibular sensations effected by the rotation.

In order to produce disturbance of space perception in the vertical plane the head was fixed in the clamp so that the axis of the chair passed through the two ears. After rotation the head was straightened and the patient again asked to project on the screen. If with the right ear uppermost the chair was rotated clockwise, the error of projection was in the upward direction, and the patient felt himself to be moving upwards and backwards; if the rotation were anticlockwise, the projection was downwards, and the patient felt himself to be moving downwards and forwards. The exact converse of these two effects was obtained when the patient was rotated clockwise and anticlockwise with the left ear uppermost. When vertical projection was disturbed, that in the horizontal plane was unaffected, when horizontal projection was disturbed the vertical was unaffected. By inclining the head at an angle of 45° to the axis of the chair it was found possible to produce disturbances of projection which were resultants of the two directions of spatial perception affected.

Pathological excitatory conditions of the labyrinth also are accompanied by disturbances in our perception of surrounding spatial relations. A patient suffering from persistent vertigo manifesting itself as a subjective rotation to the right, in consequence of irritation of the

vestibule from suppurative otitis media, showed a pronounced tendency to project over to the right side. In a series of six other cases suffering from persistent vertigo in consequence of middle-ear disease three cases showed lateral displacement of projection. In these three cases there was definite subjective rotation towards the side to which projection was displaced. In the three other cases there was no definite sense of rotation, but a generalized giddiness with tendency to fall over to the side of the lesion. No case of middle-ear disease with vertical displacement of projection has been met with, and it would appear that such cases are likely to be rare, inasmuch as it is the external horizontal semicircular canal that is, as a rule, affected when inflammation begins to spread from the middle ear.

Since the cerebellum represents the primary centre for impulses passing from the vestibule, it might be expected that irritative lesions of the cerebellum would give rise to disturbances of spatial perception. In cases of cerebellar or extracerebellar tumours attacks of acute vertigo may be considered to be due to irritation from the presence of the tumour. Four such cases were investigated during the attack of vertigo. Two cases of extracerebellar tumour in which the diagnosis was verified afterwards by operation suffered from attacks of subjective rotation of self towards the side of the lesion. In both these cases an examination made during the attack showed that there was an error of projection in the direction of the side of the lesion. In one case the error was purely on the horizontal plane. In the other it was slightly upwards and to the right, and in this case the patient said that he not only felt as if he were turning to the right, but also that he was falling backwards. In a case of tumour of the vermis verified post mortem the patient was subject to attacks of vertigo during which he felt as if he were being propelled upwards by the ground on which he stood, and objectively a tendency to fall backwards was manifested. Examined during an attack, there was an upward error of projection whilst the relations of projection in the horizontal plane were undisturbed. The fourth case was that of a glioma invading the right lateral cerebellar lobe. This case was also verified post mortem. He was liable to attacks of vertigo with a subjective sensation of rotation away from the side of the lesion; and during the attacks projection was also dislocated away from the side of the lesion, but was undisturbed in the vertical plane.

It might seem probable that similar disturbances of spatial percep-

tion would be met with in cases exhibiting cerebral lesions when the areas of cerebral representation of the vestibular sensations were subjected to irritation; but though the fact that we are conscious of the vertigo produced by stimulation of the semicircular canals implies some form of cerebral representation, no evidence of a true subjective vertigo has, as far as I am aware, been gathered from the clinical study of cerebral lesions. The sensations of giddiness of which cases suffering from frontal lesions so frequently complain are more in the nature of a vague sensation of disturbance of equilibrium rather than the positive dislocation of the spatial perception in any one direction which we call vertigo. A large number of epileptic fits begin with a perfectly definite horizontal or vertical vertigo in a direction which is always constant for the same patient, but I have had no opportunity of making observations on the disturbances of projection during such epileptic auræ.

Turning now to the cases presenting disturbances of spatial perception due to absence of normal vestibular impulses, I have had the opportunity, through the kindness of Mr. Macleod Yearsley, of examining an exceptionally interesting case in which the patient was deprived of both vestibules during middle life. The patient was a clergyman who had suffered from bilateral suppurative otitis media for years. The internal ear on one side had undergone complete necrotic destruction, and then the patient began to suffer from such intolerable vertigo that Mr. Yearsley decided on extirpation of the remaining labyrinth. The operation was completely successful, and for two years before I had an opportunity of observing him the patient had been free from all symptoms of vertigo. As long as the patient was able to guide himself by sight there was nothing abnormal in his gait. But as soon as the eyes were closed the patient became extremely unsteady, and eventually collapsed on the floor. He had already noted for himself that he was quite helpless in the dark, and on the one or two occasions when he had incautiously got out of bed in the dark he had remained collapsed on the floor unable to move till morning. He described his sensations in the dark or with his eyes shut as a feeling of utter bewilderment; he could form no idea of his position or the nature of the efforts that he must make to remedy it. Nor when he had made any effort to sit up was he able to judge of the effect of his movement by any recognition of his altered position in space. He was, however, inclined to think that latterly he had grown a little less helpless in the

dark, so that it would appear as if the muscular sense were becoming more educated to come to the rescue of the organism deprived of its vestibular sensations. The patient was then tested in order to determine whether the muscular sense was in any way affected. The precision of his co-ordinated movements appeared rather above the average, and there could be no question of any loss of muscular sense. The muscles on either side possessed good tonus, and all movements were executed with the degree of strength that might be expected from an active man. Projection was carried out with an accuracy that was only a little below normal when the patient was tested with the screen; in other words, he was able here to supply his deficient vestibular perception of space by his muscular sense. When, however, the patient whilst projecting with his eyes shut had unwittingly moved his head it was found that the projection, though still free from gross errors, became markedly less accurate. Asked to draw a cross on a piece of paper presented to him with his eyes shut, he was able to do so with some fair degree of accuracy, but when asked to perform the more complicated feat of drawing four lines intersecting one another at the same spot as in the national flag his production was distinctly less good than that of normal people. I am in some doubt as to how such an abnormality should be interpreted. It would appear that it might be that muscular sense and joint sensations are in themselves insufficient to guide the performance of the more complicated movement. Further evidence is, however, needed on this point. Placed in the rotating chair, no vertigo or nystagmus could be elicited after rotation, and of course there was no disturbance of projection. The patient was unable to give any idea of the angles through which he had been rotated when precautions were taken to prevent his being guided by light falling through the eyelids, or sound.

Turning to the cases in which the vestibular deficiency is congenital, one is at once struck by the degree with which such loss can be covered by joint and muscle sense when the aid of vision has been eliminated.

The relation of deaf-mutism to absence of vestibular function has been investigated by many observers. James¹ was the first to record any observations on this subject, and he found that giddiness was unknown in 55 per cent. of his cases of deaf-mutism. Kreidl² also found

¹ James, "Sense of Dizziness in Deaf-mutes," *Amer. Journ. of Otol.*, Bost., 1882, iv, pp. 239-54.

² Kreidl, "Beiträge zur Physiologie des Labyrinthes," *Pflüger's Archiv f. d. ges. Physiol.*, Bonn, 1891-92 li. pp. 119-150.

that 50 per cent. of deaf-mutes have no sensation of giddiness on rotation. These figures agree fairly well with the observations of Mygind, who examined post mortem 118 cases, and found pathological changes in the vestibules of 50 per cent. Through the kindness of Mr. Macleod Yearsley I was able to investigate the effect of rotation on the spatial perception of a number of deaf-mute children. Fourteen cases were examined, and in four of these there was a complete absence of vertigo after prolonged rotation. Nystagmus was also absent. In all these four cases projection was performed with fair accuracy before rotation, and was undisturbed afterwards. All four showed some slight unsteadiness when attempting to stand on one foot with the eyes shut, and on being ordered to march straight ahead for a distance of 20 yards with the eyes shut they showed a much more marked tendency to deviate from the straight line than a normal person. The deviation took place sometimes to the right and sometimes to the left when proper precautions were observed to prevent their being influenced by external sounds or strong lights piercing the eyelids. It would appear that in these cases muscular and joint sense had succeeded in making up to a great extent for congenital vestibular defect, but not entirely so. Among the other ten deaf-mutes who showed signs of possessing vestibular function, vertigo was particularly hard to elicit by rotation in three cases, and projection after prolonged and rapid rotation was only slightly disturbed. In the remaining cases the spatial perception appeared to be normal.

I have unfortunately not been able to obtain undoubted cases of unilateral vestibular destruction for these investigations.

The elucidation of the disturbances of spatial perception due to destructive cerebellar lesions is more complicated. In excitatory phases the subjective vertigo is from the side of the lesion in intracerebellar tumours, and to the side of the lesion in extracerebellar tumours involving the vestibular nerve. This, as Holmes and Stewart¹ suggest, may be due to each vestibule having a crossed connexion with the contralateral half of the cerebellum. In cases of intracerebellar tumour when irritative phenomena are absent, there is of course no vertigo, but there is a constant tendency for the patient to deviate over to the side of the lesion. This tendency to deviate toward the lesion would appear to be of the nature of a negative phenomenon. The patient, if questioned, will tell one that he feels impelled to go over to the side of

¹ Stewart and Holmes, "The Symptomatology of Cerebellar Lesions," *Brain*, 1904, xxvii, pp. 552-91.

the lesion because he feels as if space were slipping away from him on that side. As one patient told me, "I feel pushed over to the side (of the lesion) because everything seems to have got displaced, and if I don't lean over to that side I should lose my grip of things there." The consciousness of this tendency may make a patient try to correct it by deviating over to the opposite side.

Two cases, one having a gumma in the left lateral cerebellar lobe and the other a glioma, both showed the tendency to deviate to the side of lesion and projected slightly to the side of the lesion when tested with the screen. It would seem possible that sensory impressions from either side are localized in the contralateral cerebellar lobe and that the vertical spatial vestibular sensation is localized to the mesial aspect of the cerebellum in the light of the case of irritative lesion of the vermis mentioned above. In one case in which there was reason to think that the cerebellar cortex had been practically completely destroyed in the removal of a large tumour, the extreme ataxy made any observation of doubtful value, but the patient certainly manifested the same inability to stand with the eyes shut as did the case with bilateral loss of the vestibule. Unfortunately, when I saw this patient some years ago it did not occur to me to further investigate her spatial perception.

The alteration of space perception caused by destructive lesions of the cerebral hemispheres has been determined with any degree of clearness in only one case. This was an elderly man, who recovered from an attack of right hemiplegia of probably thrombotic origin with visual aphasia and right hemianopsia. The hemiplegia completely cleared up, but some degree of visual aphasia persisted, together with hemianopsia. The patient experienced the greatest difficulty in finding his way, frequently losing himself when sent from the ward into the yard. At the same time he was able to describe objects that had been shown to him, and the general aspect of the buildings in the hospital, yard, and passages, with a fair degree of accuracy, and it did not seem to be possible to adopt the obvious explanation that his lack of sense of direction was due to loss of visual memory. Tested with projection on the screen, he showed considerable mental confusion. The spots localized by him were at first fairly accurate, but after a second or third trial without opening his eyes in the interval the localizations made were very wild and he seemed to have to a great extent lost his bearings. Placed on the rotating stool and moved through various angles, he could only give the vaguest guesses as to their aperture, though he never

mistook the direction in which he had been moved. Rotation in either direction produced a perfectly normal after-effect with dislocation of projection.

Another case of right hemianopsia without aphasia showed no disturbance of his spatial perception. No disturbance in three cases of right and left hemiplegia without hemianopsia was noted.

A weakness in the apperception of changes of direction is not an uncommon phenomenon in perfectly normal people. There is no reason to apprehend that their visual memory is defective and they are apparently normal in their judgment of angles through which they have been rotated, but they easily become confused as to the direction they have taken and lose themselves with a facility which seems incredible to the average person. They are easily confused with maps and can only orientate themselves with them by turning the map so as to represent themselves standing opposite to the upper border of it, in other words, by using muscular sense rather than the sense of direction. Such types, which are well known to those who have to train men in map-reading in military colleges, would appear to belong to a class in which a slowly atrophying sense has undergone more rapid degeneration than usual.

The series of observations on cases presenting excitation and absence of function of the vestibule seem to afford evidence of the existence of a special function for the perception of space. The utility of this function to the human being seems to be of doubtful value, inasmuch as it admits of replacement to a great extent by the tactile, afferent, muscular and visual systems. It is probably of great importance in blind animals, where we find a much greater development of the vestibular system, and in animals such as dogs, which use sight comparatively little, knowledge of spatial relations would be mainly acquired by the vestibular system. It is from the point of view of the psychologist that the vestibular perception of space should offer a welcome aid in dealing with the subject of space perception. Cyon¹ perceived and was the first to draw attention to the importance of the semicircular canal as an organ for the perception of space, and with great boldness he argued that the vestibule represented not only an organ for the perception of space, but represented the physical site of the metaphysical concept of space. His arguments were, however,

¹ See article "Espace" by Cyon in Richet's "Dictionnaire de Physiologie," Par., 1902, v, pp. 562-74, for a résumé of his views and bibliography.

founded on the very insecure basis of his observations on the dancing mouse, and subsequent work on the labyrinth of these animals makes his claim for the discovery of an unidimensional organism improbable. He misapprehended, too, the function of the vestibule as an organ for transmitting sensory impressions of head movements, owing to his reliance on the observation of forced movements produced by rotating animals as a criterion of vestibular activity. We are not here concerned with the question as to whether knowledge of space is *a priori* in the epistemological sense, but merely from the point of view of the psychologist, it is impossible to account for the power of the mind to spatially order the perceptions that it receives from its visual tactile and muscular senses, since by no process of thought can we be conceived to attain the space element in our perceptions from a combination of sensations varying only in intensity and quantity.

The problem, however, becomes altered if we conceive of all sensations being projected on a continuous stream of sensation operating from the three dimensions of space and qualifying every sensation by variations in intensity and quality of its three dimensional attributes. That there is such a continuous stream is suggested by the observations that have been above detailed on the effects of deprivation of vestibular activity, or of its cerebellar, and possibly of its cortical receptors, together with the disarrangement of our spatial perceptions that appears to take place from irritative processes affecting these vestibular impulses. It might be argued that if this were so, the congenital deaf-mute would have a very different perception of space to our own. The answer to this is that, for all we know, the deaf-mute with an absence of vestibular impulses may have a very different perception of space to the normal person. As Dr. Ward has pointed out with reference to another argument, it is a frequent error of philosophers to confuse the concrete spatial experiences constituting actual localization for the individual and the abstract concept of space generalized from what is found to be common in such experiences. The difference in behaviour between a man and a dog as regards perception of space would be inappreciable, though it may reasonably be doubted whether all sensations present to the dog the spatial attributes that they undoubtedly do to a man. To investigate this problem it would be necessary to find an adult deaf-mute with complete loss of vestibular sensation, with an intelligence of high order. So far, the only two intellectually promising cases of deaf-mutism that I have had occasion to examine have both preserved

vestibular sensation. To Cyon belongs the credit of having first definitely stated the possible function of the vestibule in the perception of space, and this paper is an attempt to put some of his speculations based on animal intelligence on the only firm basis for such an inquiry—that of observation of the human subject.

DISCUSSION.

Dr. WILFRED HARRIS said he had heard one interesting fact which bore on what Dr. Golla said about deaf-mutes and vertigo—namely, that it was almost impossible to make deaf-mutes seasick. He understood there was a conference of deaf-mutes on the Continent about two years ago—he did not quite know how they conferred—and that a number of deaf-mutes were sent from America to that conference: though there were thirty of them and rough weather was experienced, they were the only people on board who did not suffer from seasickness.

Sir DAVID FERRIER, F.R.S., said he had listened with great interest to Dr. Golla's contribution, which he did not feel competent to discuss on a first hearing; it needed careful study. He would like to ask only one question—viz., whether the author considered it to be thoroughly well established that the vestibular impressions reached the centres of conscious sensation. This, he thought, had a very important bearing on the question of the perception of space.

Mr. MACLEOD YEARSLEY, referring to the question of becoming lost in the dark in a patient in whom both vestibules had been destroyed, one by operation and the other by disease, said that in the present week's *Lancet*¹ he was publishing a case in which he destroyed the vestibular apparatus on account of incurable vertigo in a woman in whom the other vestibule was normal. He had not seen the case for more than a year, and the operation was done on May 28, 1910. But, in view of the results in an earlier case referred to, he wrote to ask whether she had any difficulty in finding her way in the dark. The answer was interesting, for she said she experienced a very unpleasant sensation when in the dark; she seemed to lose control of herself and was afraid to venture further. She could not imagine a clear space in front of her, although she might feel certain the way was clear. One vestibule in her case was complete, the other had had the vestibule, with the ampullæ of the semi-circular canals, curetted and swabbed with a solution of formalin, an operation which completely cured her vertigo. As she would be coming to town some time during this year, he proposed to give Dr. Golla an opportunity of examining her.

¹ *Lancet*, 1912, i, p. 428.

Dr. GOLLA, in reply, said vertigo in itself might be regarded as a conscious sensation from the labyrinth, but he admitted that in vertigo there was consciousness of a displacement of the ordinary balance between the vestibular sensation and the muscular sense. It was when there was a discrepancy between the two sensations that one became conscious of something being wrong in the position of the head. He did not think that during normal life the function under consideration entered into consciousness, but it might be likened to the visual sensations which we were not conscious of possessing until they became disordered and produced discomfort. When there was a destructive lesion of the vestibule the person behaved in a different way; he was unbalanced and his sensations were different from what they would be were both vestibules acting. He believed that the constant inflow of vestibular sensation gave a spatial tone to all other sensations.

Neurological Section.¹

March 21, 1912.

Dr. F. W. MOTT, F.R.S., President of the Section, in the Chair.

Case for Diagnosis.

By E. FARQUHAR BUZZARD, M.D.

M. T., FEMALE, aged 44, complains of a difficulty in talking and in writing, which began eight years ago and gradually got worse, but has been more or less unchanged for some years now. She says she can write only a little and that very slowly, as her arm gets tired and aches and shakes. She has some difficulty in using her hands in other ways as well as in writing. They used to shake very much when she lifted anything, but this has got rather better. She complains also that she is not quick at anything as she used to be, and that she has lost strength generally. Her walking began to get bad about five years ago, especially out of doors or on going down an incline, but she thinks it has improved again. Her whole condition, however, varies, she says, being worse when she is tired or excited. Other points in the history are negative. She was married seven years ago and her husband died of cancer five years ago. She had one miscarriage and was very much worse after it. She considers that her symptoms were worse about five years ago, at the time of her husband's death, than they are now. She has been a cook, but has not done much work for some time.

The patient is a well-nourished woman of about the age stated, intelligent, and a moderately good witness, somewhat over-emotional (i.e., easily amused, not tearful). Her speech is slow, deliberate and indistinct. The temporal fossæ seem wasted and there is possibly some weakness in the action of the temporal muscles and in opening the mouth. The mouth movements are bilaterally weak and the face is somewhat spastic. The palate movements are a little sluggish and the reflex very

¹ Clinical meeting of the Section held at the National Hospital, Queen Square, W.C.

poor. When she attempts to write there is an excessive rigidity of the right arm and hand, and a coarse, slow tremor of the whole limb. The attempt to sew brings out the same phenomena but to a less extent. The abdominal reflexes are absent, the deep jerks are brisk, the plantars are flexor on the left side and indefinite flexor on the right. The gait is a little unsteady and a little spastic. The right foot is sometimes scraped a little on the floor. In other respects examination is negative. The Wassermann test is negative.

DISCUSSION.

Dr. BUZZARD said the case was brought before the Section in order to elicit an opinion as to the diagnosis. It might be described as a pseudo-bulbar palsy or a double hemiplegia, but these names gave no clue as to the nature of the lesion. The history of the onset and course of the disease was against disseminated sclerosis, and there was nothing to suggest a gross lesion such as a tumour. On the other hand, there was nothing to indicate arterial disease such as would account for vascular lesions. He drew attention to the fact that no extensor response could be elicited, but it was his experience that in a great many cases of double hemiplegia, whether of vascular origin or of degenerative character, flexor responses are obtained in spite of the undoubted affection of the pyramidal tracts.

The PRESIDENT (Dr. F. W. Mott, F.R.S.) remarked on the fact that although the Wassermann reaction was negative, the patient had had one miscarriage. He asked whether she had had any healthy children. Not long ago he saw a case in which he made a post-mortem examination and found vascular lesions in the internal capsules sufficient to account for the symptoms, which were similar to those in this case. It was a syphilitic case. He had met with cases in which, though the Wassermann test was negative, mercury and iodide of potassium cleared up the symptoms.

Dr. BUZZARD replied that the patient had had no healthy children. There had been one miscarriage during her short married life of two years.

Case of ? Myasthenia Gravis.

By E. FARQUHAR BUZZARD, M.D.

K. N., FEMALE, aged 14, at the age of 6 is said to have been ill in bed for a few days with a slight attack of influenza. After that it was noticed that she did not seem to have any strength nor to play actively as she used to do. This general weakness gradually got worse. No special weakness has been noticed in any particular part of the body except,

perhaps, in her back, which she cannot hold up very well for long. She has difficulty also in getting up steps. Her legs and arms ache; her throat aches if she talks much. She is subject to headaches and her sight gets blurred readily. She is the eldest of four children, the others being quite well. There is a previous history of "tonsils and adenoids."

On examination, she is found fairly well nourished, but the muscular development in the trunk and limbs is poor. There is a general weakness of all muscular movements without any localized wasting. The back especially is weak and hypotonic. She is easily fatigued. Her gait shows considerable waddling movement and when she is standing up there is marked lordosis present. Electrically, the muscles respond poorly but show no polar changes. They tire readily to repeated faradic shocks, but do not cease contracting in a myasthenic way. There are no mental or cranial nerve changes (except a refractive error in both eyes) and no sensory or reflex changes.

DISCUSSION.

Dr. BUZZARD explained that the nature of the case was no longer in doubt after the experience of that evening. The result of sitting up late and being frequently examined was to produce an unmistakable picture of myasthenia gravis. On previous occasions and during the early part of the evening she had always been able to carry out any movement with a moderate degree of force, but during the last half hour she was quite unable to lift her arm at all, and her head tended to roll forwards or to one side if unsupported. She had exhibited therefore a most typical myasthenic exhaustion.

Dr. S. A. K. WILSON said he was not aware that, as Dr. Buzzard had just said, more definite symptoms of myasthenia had developed in this case during the course of the evening. When he saw her first the patient presented the difficult problem of differentiating between myasthenia and myopathy, because of the muscular wasting. Inasmuch as the tendon reflexes were very brisk, especially in the arms, notwithstanding the muscular wasting, myopathy might be definitely excluded. From the point of view of myasthenia the case was odd, inasmuch as the disease apparently commenced at the age of 5 or 6, and was so advanced as to cause atrophy of certain muscular groups, yet the cranial nerves were not involved at all. He asked whether Dr. Buzzard remembered the case of a patient under his care at the hospital some years ago, in whom no definite diagnosis was ever made, although a post-mortem examination had been held. The case was that of a man who had a history somewhat similar to this girl—a generalized muscular asthenia coming on after influenza. It progressed very slowly, and there never were any very definite symptoms; but the man got steadily worse, becoming more and more asthenic,

and eventually died. The findings in the nervous system were apparently negative, except for a curious hyaline degeneration of blood-vessels and a condition of the muscles indicative of a chronic toxic change, with irregular fibres and some small-cell infiltration not unlike the lymphorrhages of myasthenia. The present patient's circulation was not good; as was the case with the man just referred to, she had cold extremities, and her myasthenic symptoms were not, in his opinion, unequivocal. He would like to know whether Dr. Buzzard considered that the man's case threw any light on the case of this girl.

Dr. BUZZARD, in reply, said that he did not clearly remember the case referred to by Dr. Wilson. The patient he was showing reminded him very strongly of another case which he had had under observation for the last year or two. This was a woman, aged 47, whose illness dated from an attack of influenza about four or five years previously, and her condition resembled that of the patient under discussion, in the fact that only the limbs and the trunk were affected, and that the muscles supplied by the cranial nerves showed very little change. The woman, however, had temporary attacks of diplopia, lasting only a few seconds at a time. He regarded these attacks as probably forming a connecting link between cases of myasthenia affecting the limbs only and those more common cases in which the cranial nerves were particularly involved.

Case of Athetosis.

By H. RIDLEY PRENTICE.

S. D., MALE, aged 9. Mother died of phthisis. He was a full-term child, and birth was easy and not prolonged. He thrived well, had no illness during the first year of life, and had no fits. He talked early, and has been a rather conspicuously bright child. He was backward in walking, however, and it was noticed that he did not sit up as well as other babies. This weakness disappeared, and he became able to run about in a normal way. About three years ago he began to use the left hand less than before and to drop things held in it; later he developed definite diminution of control of the left hand, associated with the appearance of involuntary movements while trying to use the limb. This condition has become slowly and progressively more marked. During the last year he has tended to drag the left foot. Throughout the course of the disease there has been entire absence of headache and vomiting; vision has been quite unaffected. He has been clean in his habits, has complained of no pain, and has never suffered from jaundice.

The patient is healthy-looking; small for his age. Teeth are good. Visceral organs healthy. He is bright and intelligent; his memory is good. Vision $\frac{6}{6}$; fundi and fields normal. Smell and hearing normal. Cranial nerves: The pupils are unequal, the left larger than the right; they are central, and the reactions are good. There is no nystagmus, strabismus, diplopia, or ptosis. Both sides of the face act well, but while talking a certain over-action of the facial muscles is present. The palate moves well. Speech appears to require effort and is stumbling. The tongue is protruded straight, but rolling, turning movements of the organ occur both when the mouth is opened widely and during the act of protrusion. Motor system: No muscular wasting is present; there is no sign of contracture beyond bilateral slight pes cavus. The upper limbs show well-marked hypotonicity, the fingers are of the "saddle-back" type, and can be bent backwards so as almost to touch the forearm. Power and range of voluntary movement are definitely diminished on the left side, but are good on the right. On attempting to use the left limb movements of a writhing, jerking character appear and interfere with the proper performance of the act attempted; they tend to increase as the act nears completion. The lower limbs exhibit to a less degree hypotonicity; the left is slightly weaker than the right. No involuntary movements have been observed. Sensory system: No objective loss can be made out, the sense of passive position is apparently perfect in all limbs, and localization of the point touched is accurate. Reflexes: Deep jerks are all well marked, being slightly greater on the left side. The abdominal reflexes are brisk, but can be tired out on both sides. The plantars show definite double extensor response. The attitude and gait are hemiplegic in type, the left arm hanging in front of the body and being rotated inwards. Patient can run, but does so in a clumsy way, management of the left leg being more difficult than of the right.

Mr. PRENTICE said that there was a gradual onset of hypotonicity, with athetoid movements. A fortnight ago there seemed to be a definite extensor response, but on repeated examination of the plantars that evening he could not get the extensor response at all. It seemed doubtful whether the pyramidal tract was involved. Apart from athetoid movements and hypotonicity there seemed to be an absence of other signs. He brought the case in order to obtain opinions as to the prognosis. The father was anxious to know what were his liabilities with regard to the child. Mr. Prentice thought there must be some slowly progressive lesion in the region of the thalami, but he could not obtain sensory loss. Otherwise the child was normal, bright and intelligent, except that during the last two years he had practically ceased to grow.

General Athetosis in Two Sisters.

By H. G. TURNEY, M.D.

FAMILY HISTORY: Mother alive and healthy. Father in an asylum; possibly G.P.I. The patients are the third and fourth of five children. The two eldest are males and healthy. The fifth, a boy, died at the age of 18 months and is said to have been affected similarly to the patients. Deliveries were all natural and at full time.

Case I.—J. R., aged 6, did not walk till she was nearly 3. No history of illness. She is poorly nourished but shows no sign of visceral disease. Mental condition is normal, though probably not up to standard of her age. She gets fits of peevishness, which it is found are best averted by rest in bed during part of the day. Speech is not affected. The cranial nerves act normally and there is no nystagmus. The head and neck and trunk are liable to slight jerky movements rather like chorea. Upper limbs: There is no tremor, and when supported the limbs show very little movement, but when extended they develop constant movement of an athetoid type, this being most marked in the peripheral segment. The fingers and thumbs perform somewhat slow excursions predominantly of abduction and extension, but these do not prevent a fairly accurate use of the hands. The patient can feed herself and pick up any small object without difficulty, can touch her nose with eyes shut and so forth. Lower limbs are well nourished and there is moderate degree of hypotonia. The knee-jerks are present and the plantar response is flexor. Movements similar to those in the upper limb are constant but much increased by muscular effort. There is no paralysis either motor or sensory. The gait is very uncertain and patient often falls down, but she is able to run. She carries her arms very much as a gibbon holds his forelimbs, the upper arm being held in an abducted position at right angles with the body, the forearm being held vertically. The feet are kept apart with the toes turned in and the weight is carried by the heels.

Case II.—N. R., aged 5, sister of the above. Well nourished and very bright. Cranial nerves normal. Patient squints at times, but eyes move well in all directions without nystagmus. The condition of the arms is very similar to that in her sister's case, but the movements are not so typically athetotic. She can use them perfectly if allowance be made for

diversion by the irregular movements. In the lower limbs the knee-jerks are present, Babinski's sign is negative, and there is marked hypotonia. The movements are more marked than with her sister and there is a marked tendency for extreme plantar flexion of the foot until it is in a straight line with the leg. She has more difficulty in walking. The legs are kept very wide apart and the feet are raised high up and then brought down rather forcibly, though they are not thrown about as by a tabetic. Walking is possible only with assistance. She is said to have improved considerably of late.

DISCUSSION.

Dr. TURNEY added that he was convinced that the affection was in the cerebellum. The elder child's athetoid movements of the hands were almost typical. The gait was comparatively little affected in the elder, but in the younger child was the extreme feature, the hands having in comparison little wrong with them. Another member of the family, who died as an infant, appeared to have had the same condition.

Dr. F. E. BATTEN considered that the cases resembled those which were included under the term "congenital cerebellar ataxy"; these were closely allied to the cases of atrophy of the cerebellum which occur in litters of kittens and puppies. The prognosis in congenital cerebellar ataxy was good if the cerebellum alone was defective, but if there was also mental or cerebral defect, though some improvement might ensue, the ataxy was never entirely lost. He believed Dr. Turney's cases were somewhat defective mentally, and he would not class them as cases of athetosis since their movements did not accord with his conception of athetotic movements. Hypotonia was a marked feature in both children.

Case of Friedreich's Disease.

By H. G. TURNEY, M.D.

FEMALE, aged 44. Very marked scoliosis which developed in childhood. Double pes cavus, absence of knee-jerks, and a mild cerebellar gait. There is no affection of the cranial nerves, speech, or of the upper limbs. She says that she has a brother with a back and feet like hers and a sister who has the feet, but not the back.

Dr. TURNEY added that he had received a letter from the doctor, who said the brother, aged 49, had a very similar condition, and that he was a heavy drinker.

Case of Syringomyelia.

By JAMES TAYLOR, M.D.

A. O., FEMALE, aged 33, came under observation first ten years ago; five years previously had a painless abscess in hand. When seen in 1902 there were wasting of interossei of left hand, characteristic claw hand, some weakness in the legs, and exaggeration of knee-jerks, with ankle-clonus, most marked in the left leg. There was also lateral curvature of the spine and wasting of shoulder muscles. Nystagmus was present, and there were characteristic sensory changes, especially marked on the left side of the body, including the face. The condition has remained almost the same, except that the motor weakness has become more marked and the sensory changes more extensive.

Case of Progressive Muscular Atrophy.

By JAMES TAYLOR, M.D.

A. D., FEMALE, aged 33. This patient came first in 1898, complaining of pain in the neck and weakness of the hands, which had lasted some months. There was extensive wasting of the upper extremities, more marked on the right side than on left. She has been under observation at intervals since. The wasting has become more extensive, so that in the upper limbs and about the shoulders it is now extreme. The lower limbs are weak, but there is no local wasting. The reflexes of the lower limbs have remained normal throughout, and there has been no evidence of involvement of the lateral columns.

Three Brothers, illustrating an Unusual Form of Family Paralysis (Familial Lateral Sclerosis with Amyotrophy).

By E. G. FEARNSIDES, M.B.

(For HENRY HEAD, M.D., F.R.S.)

Case I.—N. B., aged 16. This patient has been under observation at the London Hospital since March, 1909. He is known to have been abnormal since November, 1903. When aged 7 he was seen at St. Bartholomew's Hospital by Dr. Ormerod.¹ At that time "he waddled

¹ *Lancet*, 1904, i, p. 17.

slightly and showed a certain degree of unsteadiness when he turned. There was no deformity of his feet, no affection of his upper extremities, and no nystagmus. The knee-jerks were well marked. Ankle-clonus was not present, but the plantars gave a response of the extensor type." In March, 1909, when he was first seen at the London Hospital, his gait was somewhat unsteady, his feet showed no atrophy of muscles. Ankle-clonus was not obtained, but the plantar reflexes were extensor in type. Since June, 1909, he has got progressively worse, so that now he can hardly stand or sit. He complains of the stiffness of his legs and a certain amount of pain on rising from a sitting posture. During the last twelve months he has found difficulty with his speech. Present condition: Poorly developed, mentally somewhat apathetic, speech slow, slurred. Motion: Scissored gait, with cross-legged progression; legs stiff, the right more so than left; double flat-foot; gross wasting of abductor hallucis and flexor brevis digitorum on right side; similar wasting but less marked on left; tendo-Achillis taut on both sides; toes in permanent Babinski position; extensor tendons to toes taut; knees held permanently flexed; double adductor spasm, right greater than left; upper limbs not stiff, no wasting. Electrical reactions: No response to coil or cells with the strongest stimuli which the patient can bear, from the small muscles of the feet, including the extensor brevis digitorum; all the muscles of the hand give natural responses (Dr. Woods). Sensation: No sensory loss. Reflexes: Knee-jerks on both sides extremely brisk; double ankle-clonus; tendon reflexes of arms brisk; plantars double Babinski extensor response; other reflexes unaltered. Fundi natural. Cranial nerves: Fine, rapid; horizontal nystagmus in both eyes, best seen on looking to right. Pupils good. Scoliosis: Affecting chiefly middle and lower thoracic regions, accompanied by some general antero-posterior curve in same region. Other systems unaffected.

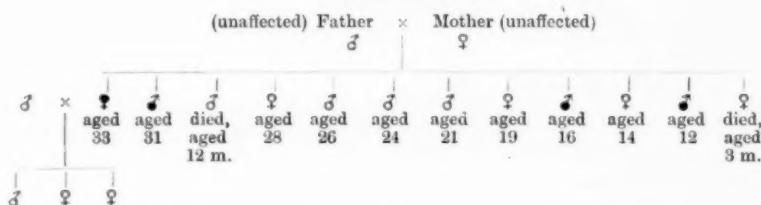
Case II.—I. B., aged 31. This patient has attended at the London Hospital at various times since the age of 6. Twenty-six years ago (at the age of 5) he was seen to drag his legs in walking. Since that time the difficulty with his legs has slowly progressed. At the age of 20 he noticed that his legs were beginning to waste. Since the age of 22 he has been unable to work, partly owing to the difficulties in progression and partly owing to the wasting of his hands. An account of his condition in 1903 is given in the *Lancet* by Dr. Ormerod.¹ At that time he showed deformities of his hands and feet and a paralytic affection of the lower limbs partly of the spastic type,

¹ *Lancet*, 1904, i, p. 17.

with increased tendon reflexes and an extensor plantar response, but accompanied by some general thinning of the muscles and a recent muscular atrophy of the muscles of the right hand. Nystagmus was also present on looking horizontally outwards. Since that time his condition has slowly progressed. Present condition: Fairly developed; mentally dull and slow; speech slow and somewhat hesitating. Motion: Legs held very stiffly, knees bent forward, cannot stand without support; legs tend to cross and then the patient falls; lower limbs thin; wasting begins in the lower third of the thigh; wasting uniform, no special muscle of legs picked out; gross wasting of small muscles of soles of feet, more especially abductor hallucis and flexor brevis digitorum; extreme double flat-foot; double hallux valgus; toes in equino-varus position; calf muscles in spasm; tendo-Achillis on both sides taut; extensor longus hallucis tendon on both sides taut; tendons of extensor longus digitorum somewhat taut; double adductor spasm of thighs; left knee reddened and skin over internal condyle rough and thickened owing to rubbing by right knee. Upper extremities: Shoulders, arms, and forearms on both sides well developed and fairly symmetrical; gross wasting of first interosseous space and of thenar eminence, and marked wasting of hypothenar eminence and of interossei of right hand; adduction and opposition of right thumb impossible, abduction weak; grips of hand powerful, but right weaker than left; right thumb kept abducted, with flexion at two distal joints. Electrical reactions: On the right side abductor pollicis gives no response to strongest coil stimulus and a very greatly diminished and sluggish response to cells; the first dorsal interosseous on this side to coil gives a very slight but definite response to strong stimulation, to cells a much diminished, sluggish response; all the other interossei on the right side give diminished responses to coil and natural responses to cells; no responses to electrical stimulation obtained from the small muscles of either foot; all other limb muscles react normally (Dr. Woods). Sensation: No sensory loss discovered. Reflexes: Knee-jerks grossly exaggerated; ankle-clonus not obtained on either side; tendon reflexes from arms on both sides brisk; plantar responses on both sides extensor. Fundi unaffected. Cranial nerves: Slow, coarse nystagmus on looking to right, more rapid nystagmus on looking to left; vertical nystagmus slight; face expressionless, right side flatter than left; on volition and emotion, movements normal; tongue not wasted, on protrusion straight; other cranial nerves unaffected. Sphincters unaffected. Spine: Slight lateral curvature, not incompatible with normal. Other systems unaffected.

Case III (for Mr. T. H. Openshaw, C.M.G., F.R.C.S.).—H. B., aged 12. A description of the condition shown by this patient in November, 1903, is given by Dr. Ormerod in the *Lancet*.¹ The patient was born with instrumental delivery. He never walked properly. At the age of 18 months, as soon as he began to get about on his legs, he was noticed "to be stiff on his legs." In recent times his condition has altered but little. He was in-patient in the London Hospital under the care of Dr. Head in March, 1909. At a later date he came under the care of Mr. Openshaw, and at the present time is in-patient at the Royal National Orthopaedic Hospital. Present condition: Intelligent and observant; speech unaffected. Motion: Before operation typical scissored gait; much adductor spasm; double flat-foot; tendo-Achillis on both sides taut; toes in permanent Babinski position; knees held flexed; some spontaneous involuntary flexion-extension movements at knees and ankles. No muscular wasting of either lower or upper extremities; hands and feet unaffected. Sensation: No sensory loss. Reflexes: Knee-jerks extremely brisk; double ankle-clonus; tendon reflexes of arm brisk, ? left brisker than right; double Babinski plantar response. Fundi natural. Cranial nerves: No nystagmus; all cranial nerves unaffected; sphincters unaffected. Spine: Scoliosis with a general antero-posterior curve affecting chiefly middle and lower thoracic regions; other systems unaffected. Whilst in-patient at the Orthopaedic Hospital he has had tenotomies of the tendo-Achillis and open tenotomies of the adductors and hamstrings on both sides, and now lies with his legs straight, in trough splints, awaiting the arrival of walking instruments.

FAMILY HISTORY.



The father and mother of these three patients are Polish Jews, who have been in England for over forty years. They have always enjoyed the best of health. The woman's mother was first cousin to the man. As far as can be ascertained there is no collateral family history on either side.

¹ *Lancet*, 1904, i, p. 17.

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The present generation consists of:—

(1) Female, A., aged 33. She has a considerable lateral spinal curvature with some slight antero-posterior curvature. She shows neither nystagmus nor involvement of the limbs. She is married and has three children: (i) aged 4 years; (ii) aged 20 months; (iii) baby aged 14 days. Her children so far are quite unaffected.

(2) Male, aged 31 (Case II).

(3) Female, aged 28, healthy and unaffected.

(4) Male, aged 26, a Staff-Sergeant in the Army.

(5) Male, aged 24, unaffected and quite well.

(6) Male, aged 21, unaffected, well developed.

(7) Female, aged 19, unaffected, well.

(8) Male, N., aged 16 (Case I).

(9) Female, aged 14, unaffected, a well-developed, healthy girl.

(10) Male, H., aged 12. (Case III.)

DISCUSSION.

Dr. ORMEROD said the cases had got worse since he saw them, one of them much worse. When he first saw this patient he walked fairly well, though the plantar response in both feet was extensor, and there was some deformity of the feet. The youngest boy appeared still to be able to use his two hands, but they were of the same shape as those of the elder brother, and the left hand was decidedly smaller than the right, so he thought the patient was developing muscular atrophy. When he saw these cases they recalled to him a series of three cases—a father and two children—who were under Dr. Gee at St. Bartholomew's Hospital. Dr. Gee published a report of them, and more recently, Dr. Gordon Holmes had written a paper in which he included all these cases and some of his own. There were some cases recorded by Higier, in Germany. So it appeared to be a definite type of disease.

Dr. BATTEN said Maas¹ had published the account of a post-mortem examination on such a case. He found degeneration of the lateral columns, changes in the anterior cells, and a small cerebellum.

Dr. PURVES STEWART said that he would not lay down a hard-and-fast rule as to operations in these cases. Even though there might be a relapse some time afterwards an operation was sometimes justified if it enabled the patient to get about again for a considerable period. In cases of peroneal atrophy, where the paralysis below the knee was complete, if the feet had been put in good position by the surgeon the patient could still walk.

The PRESIDENT said he had had a case of Friedreich's disease operated upon, and he thought it improved. But the patient died three months after the operation. He had a very large heart, and the cause of death was heart failure.

¹ *Deutsche Zeitschr. f. Nervenheilk.*, Leipz., 1911, xli, pp. 236-45.

Case of Long-standing Clonic Tic improving under Treatment.

By HAROLD CROSS.

(For W. ALDREN TURNER, M.D.).

A. S., FEMALE, aged 18. Family history shows one married sister who bites her nails and has a slight tic, no other nervous trouble or disease. Twitchings began at school five years ago, and a little later severe movements commenced three weeks after a fright from fire. Two years ago the patient was treated for two months at the National Hospital, and was discharged greatly improved. Until July, 1911, the condition remained unchanged or only slightly worse, but the movements then became much worse and were not appreciably alleviated by three months' treatment at a general hospital. In November, 1911, a further exacerbation occurred. The movements consist of (1) rapid shock-like contractions of the shoulders, with shaking of the head at irregular intervals, involving especially the deltoids, the trapezii, the pectorals, and the sternomastoids; and (2) flexion and extension movements of the hips and knees. The movements cease during sleep, and increase with attention and excitement.

The patient was re-admitted to the National Hospital under Dr. Aldren Turner on January 26, 1912. Treatment by exercises and encouragement has again resulted in considerable improvement.

Mr. CROSS added that the case was shown chiefly as an encouraging example of what could be accomplished by persistent treatment in long-standing cases of the kind. At a general hospital the patient had been under isolation, spinal douche, passive treatment, &c. He suggested she was able to cure herself, but needed help. A number of physical exercises, immobility in front of a mirror, and special movements were prescribed. The sister and nurses took an interest in her case, and that had much to do with the improvement. Her ultimate progress would largely depend on whether interest would be taken in her when she left the hospital.

**Case of Astereognosis, probably due to a Lesion of the
Posterior Columns in the Cervical Region.**

By F. E. BATTEN, M.D.

M. S., FEMALE, married, aged 52. The illness commenced two months ago by pain behind the right ear after a hard day's work, the patient having been quite well previously. The following evening numbness was felt on the right side of the neck and on the right arm. It is described as like the contact of cold, wet clothes. In the course of ten days this feeling spread to the legs and body. Soon after this weakness in the legs made walking impossible, but recently the patient has been able to walk again. At about the same time difficulty in using the right hand was noticed, and on one occasion a cup of tea was dropped. Four weeks after the onset the patient had pain behind the left ear, and numbness of the left arm and neck, followed by difficulty in using the left hand. She noticed that she could not find her hands under the bedclothes. There has been no numbness in the face at any time.

Present condition: No affection of the mental state, the special senses, or the cranial nerves. Motion: Upper extremities show slight wasting of the interossei and abductor indicis on the right side, and to a still slighter degree on the left. There is some spasticity in the right arm, and possibly a little in the left. The right arm is distinctly weaker than the left. There is no tremor when the hands are outstretched, but there is a slow movement of the fingers and a falling of the hands on closing the eyes, also some movement when the eyes are open. There is marked inco-ordination of both hands, especially the right, and great awkwardness in using them. Lower extremities are much less affected, the right leg is rather spastic, and is weaker than the left. Co-ordination is good. Sensation: There is gross loss of the sense of position, of the recognition of objects, of the feeling of vibration, and of the discrimination of compass points in both upper extremities. Discrimination in the left leg is a little defective as compared with the right leg. Tactile, painful and thermal sensation is intact, except that there is slight relative loss over the digits and the palms of both hands. Localization is perfect. Reflexes: All the deep reflexes are exaggerated, equally in the upper extremities, more on the right in the lower extremities. The abdominal reflexes are absent, the plantar reflexes are indefinite.

DISCUSSION.

The PRESIDENT asked whether the lesion might not be in the posterior column nuclei. The sensory loss was not very definite. He once performed the experiment of removal of the posterior nuclei of one side in monkeys, and all he noticed as a result of the operation was that the animal was awkward in the use of its hand. But, of course, one could not test it in the same way as in the case of a human being. The animal apparently completely recovered after a short time. This patient complained also of an affection of the leg on the same side; both the nuclei of Goll and Burdach on the same side would therefore have to be damaged to produce this condition.

Dr. H. H. TOOTH said that many years ago in experimenting on monkeys he had successfully destroyed the nucleus funiculi gracilis on one side, the lesion being confirmed by microscopical examination post mortem. He had been unable to detect loss of sensation of any kind on either side after the operation.

Dr. PURVES STEWART said that last week he saw a patient who had every symptom which this patient presented. The case was that of a woman, aged 47, who was on the verge of the menopause. In the beginning of February she was skating in Switzerland and four days after her return to London, when she was washing her hands, she suddenly found she could not feel the soap properly. Next day she was unable to hold a coffee cup steadily. She showed the same physical signs as in Dr. Batten's case, even to the absence of the abdominal reflexes. The plantars were flexor in type. The lesion in the spinal cord, which would account for these symptoms, would have to be a bilateral symmetrical one, not in the mid-line, but in the postero-external columns. The postero-internal columns must have escaped, as there was no affection of joint-sense in the legs. His patient also had pains on the back and neck, and a similar patch of hyperæsthesia on the front of the chest. In his case the symptoms came on in a few days, very rapidly reached their maximum, and then began to regress. Possibly she had a hæmorrhage, which filtered down the back of the cord, in the cervical region, clinging to the posterior roots, and perhaps catching the postero-lateral columns. He did not know whether the menopause might be a factor, predisposing to a vascular lesion. He suggested that the cerebrospinal fluid should be examined.

Dr. S. A. K. WILSON said he did not see how the lesion in Dr. Batten's case could be strictly limited to the posterior columns, because of the fact that the right limbs were definitely spastic. The jerks of the right arm were distinctly brisk, the scapulo-humeral reflex was brisk, but the carpo-metacarpal reflex was diminished. These facts, in view of the difficulty of supposing that lesions of the posterior columns could produce an increase in reflectivity, showed conclusively that the lesion must have overflowed out of the posterior

columns; apparently it was the outer part of the posterior columns which was caught. He wondered whether, in this case, there might be some such condition as syringomyelia of the posterior horns, which need not mean there would be any symptoms unless there were such an occurrence as hæmorrhage into it. In that case the symptoms would appear somewhat suddenly. It was well known that syringomyelia might be entirely latent. He had seen a syringomyelic cavity in the upper part of the cord where the defect was confined to one posterior horn, and he believed some such bilateral lesion, partly involving the pyramidal tract on one side, and the posterior external column on the other, might account for the symptoms in this peculiar case.

Dr. HINDS HOWELL said he did not think it was possible to imagine that the lesion was in the posterior columns at all, as it would be difficult for such a lesion to escape involving some of the intramedullary root fibres, and it would almost certainly have produced some definite loss of other forms of sensation. He thought it easier to imagine a lesion somewhere in the inter-olivary layer of the fillet, or internal arcuate fibres, a little higher than was suggested by Dr. Mott. Such a lesion would involve fibres carrying those impulses which were absent in this case, and would not interfere with sensations of heat, pain, cold, or touch. It might also cause a disturbance of the pyramidal tracts. It was conceivable that it would produce at first sensory disturbances involving all one side, and as the lesion diminished one would find regression of symptoms to a residuum corresponding with the maximal focus of disease.

Dr. HENRY HEAD said it was difficult to place the lesion with certainty, but it was obviously on the same side as the symptoms. Pain on the right side of the head was followed by an affection of the right arm; then pain on the left side was followed by an affection of the left arm. The disturbance of function was on the same side, apparently, as the pain representing the local lesion. Therefore the fibres had been caught before they had passed across the posterior column nuclei to the fillet on the opposite side. If the lesion lay in the inter-olivary layer above the pyramid, it could catch the fibres as they were passing to the opposite side, and at the same time affect the pyramid. With regard to the nature of the disease, it was extremely difficult to speak with certainty. The onset was sudden for such a condition as disseminated sclerosis; otherwise, disseminated sclerosis could produce such effects. He understood Dr. Wilson to suggest that it was possibly syringomyelia, extending outwards, so as to cut the fibres as they crossed from the external nucleus of the posterior columns, and at the same time downwards towards the pyramid. If the lesion lay in the posterior columns it must lie in the cervical cord. If it were syringomyelia, he took it there must have been hæmorrhage into it. If the lesion were a vascular one it was remarkably bilateral; most of the vascular lesions from the posterior column nuclei upwards were unilateral, but there were some lesions of the bulb which were bilateral, especially those which affected the structures in the middle line.

Dr. WILFRED HARRIS said a case he had had under care at St. Mary's Hospital in the last few months, although not on all fours with the present case, was interesting from the point of view of the patient's complete loss of sense of position in one arm. The man developed some pain in his neck and back of his head, then had weakness of his right arm, and later weakness of his right leg, and finally weakness on the left side. When seen the striking feature was a spastic right arm and total loss of the sense of position in the arm. But it differed from Dr. Batten's case in that there was considerable anaesthesia also. The patient had analgesia and considerable power of grip and deep anaesthesia in his hand, diminishing above the elbow. He also had some spastic weakness of the right leg, and later on spastic weakness of the left. As the analgesia extended over the neck and back of the head it was a lesion at the level of the first or second cervical segment. He had him operated upon in the hope of finding a tumour which might be removable. Some adhesions were first found, then there was an escape of cerebrospinal fluid. As there was no sign of tumour he then hoped it was a local meningitis, and he urged the surgeon to break down all adhesions and to pass a flat spatula towards the foramen magnum. The surgeon said he felt a tough adhesion at that level, and he (the speaker) asked him to break it down. When he pushed there was a great gush of blood, and the man died in three hours. Post mortem there was found an aneurysm the size of a walnut of the right posterior inferior cerebellar artery, which was pressing on the posterior columns.

Dr. BATTEN, in reply, said the case presented great difficulties, and he was indebted to his colleagues for the help they had given him in elucidating it as far as that could be done. With regard to the point raised by the President, he did not know how one could distinguish between a lesion in the posterior column nuclei and a lesion of the posterior columns. The next question raised was whether the lesion was above the posterior column nuclei as Dr. Howell had suggested. If it did lie above it was difficult to imagine why the lesion should have picked out the stereognostic sense and left the tactile and other sensations unaffected. If the fillet were involved one would have expected that the tactile and other sensations would have gone. It seemed much more easy to explain the symptoms by a lesion of the posterior columns. He was unwilling to accept Dr. Wilson's suggestion as to syringomyelia, for loss of sensation to heat, cold and pain was so characteristic in syringomyelia that he doubted whether one was justified in diagnosing syringomyelia when thermal anaesthesia was not present. This woman appreciated heat and cold perfectly. There had been no injury in this case. He agreed that the cerebrospinal fluid ought to be examined, in the hope that it would give some indication of the nature of the lesion. The case related by Dr. Wilfred Harris was very interesting, and he would have liked to have known the exact situation of the aneurysm in relation to the posterior columns.

Case of Unilateral Ataxia.

By F. E. BATTEN, M.D.

L. G., AGED 4, is the third of three children. He has never been strong, but was in his usual health till six months ago. At this time his mother noticed shaking of the right hand, and about one month later some unsteadiness of the right leg. He has complained of headache, and has vomited from time to time, but neither the headache nor the vomiting has been severe.

On examination he appears an intelligent boy, exhibiting no weakness of the cranial nerves and no optic neuritis. He does not willingly use the right arm, but when asked to do so he grasps it with the left hand and performs the movement requested. When asked not to hold the right arm with the left and to attempt a movement, he raises the arm, but the movement becomes so wild that he tends to hit himself in the face. The power of the right arm is fairly good. The boy can co-ordinate better when performing symmetrical movements than when performing movements of the right hand only. There is inco-ordination of the right leg on attempting movement, but much less than in the arm. The boy can walk fairly well, he tends to swing the right leg, but he is much less unsteady than one would be led to expect from the amount of inco-ordination present when in a lying position. The abdominal reflexes are active and equal, the knee-jerks are active, the right being greater than the left, there is no clonus, and the plantar reflexes are flexor. No alteration of sensation can be detected. The cerebrospinal fluid is normal, and the von Pirquet reaction is negative.

The case is shown in order to elicit opinions as to whether the boy has a lesion of the right lobe of the cerebellum or a lesion of the basal ganglia of the left side.

DISCUSSION.

Dr. FARQUHAR BUZZARD said that he obtained an extensor response in the right foot and that he had found that when the child was induced to make some effort at movement with the right arm or right leg, associated movements occurred in the other limb of the same side. For these two reasons he thought that the lesion was situated in the basal ganglia, and not in the cerebellum, and he was inclined to think that there were signs of the condition becoming more bilateral.

Dr. BATTEN, in reply, admitted that the plantar reflex was extensor that evening, but on all previous occasions it had been flexor. The abdominal reflexes were equal and active, and there had been no clonus. His view was that it was a mid-brain lesion, and he expected that as the intracranial pressure increased the alteration in the reflexes would become more definite.

Case of Paralysis of the Left Third Cranial Nerve associated with Left-sided Headache.

By DONALD HALL, M.D.

R. G., male, aged 30, zinc worker. Family history good; previous health good; married over three years; one healthy child, aged $2\frac{1}{2}$. One miscarriage one year ago. No history of venereal disease. Occupation: He works in zinc, copper, iron, brass, and lead-coated iron, and is often exposed to the fumes of strong hydrochloric acid.

Present illness: On January 17, 1909, "a pain caught him right across the head." The pain lasted for six weeks and was more severe on the left side. After this gradual paralysis of the left third set in: first diplopia, then complete ptosis—later the ptosis cleared up and the diplopia became troublesome again, and has not left him. He then began to have attacks of left-sided headache with sickness, without any usual phenomena, and the third nerve paralysis become complete.

Present state: The ptosis is now clearing up under mercury and iodide. There are no physical signs of disease other than the left third palsy. Wassermann tests in the blood and cerebrospinal fluid were both negative.

A Case of Adolescent General Paralysis.

By H. C. R. DARLING, M.B.

H. M., A GIRL, aged $15\frac{1}{2}$, was quite well and able to do box-making until eighteen months ago, when her sight began to fail and she dropped things. She was treated at Moorfields Hospital by Mr. Treacher Collins and was ultimately sent to a school for the blind, where she remained for six months. She was found to be very dull and was very slow in learning. Nine months ago she was admitted to Guy's Hospital for defective sight and came under the care of Dr. Hertz owing to

having developed a fit which left some weakness down the left side of the body; this paresis passed off in about a week. For the last three months her mental powers have still further deteriorated, she has become difficult to manage at home, talks to herself in a disconnected fashion and especially about a necklace she has lost; answers questions with much hesitation at times, and is incontinent of urine and stools. A few days before admission to the hospital she had a fit of temper in which she beat her head violently with her hands. She has had headaches for two years, often most troublesome at night. Other than typhoid fever at 6 years and whooping-cough and measles in earlier years, she has not had any other illness. There is no history of miscarriage in the mother and no history of specific infection in other brothers or sisters.

She is a stout girl who gives one the impression that she does not see distinctly; there is well-marked optic atrophy of both disks (primary). Both pupils react to light and accommodation. Hearing is normal. She frequently talks to herself and is incoherent. There is no apparent marked muscular weakness or atrophy. She walks badly with both feet rather wide apart. There is no tremor of the facial muscles, though occasionally the tongue is tremulous. Most of the reflexes are normal, but the knee-jerks, especially the right, are obtained occasionally with difficulty; the plantar reflexes are normal. The only abnormality of sensation is a little blunting of appreciation to pain in the lower extremities. The left tibia shows a well-marked node and the blood gives a marked Wassermann reaction. Two lumbar punctures were made, but cytological examination failed on both occasions, the first time owing to blood contamination and the second time owing to coagulation of the fluid.

A Case for Diagnosis.

By H. H. TOOTH, C.M.G., M.D.

THE patient was a man, aged 46, in whom there was no history of syphilis; he denied risk of it, and the Wassermann reaction was negative. He did not drink more than two or three glasses of beer per day. Last August he became almost suddenly weak in the extensor muscles of the right forearm. He said he struck his arm. He now had complete double wrist-drop, and the muscles gave a feeble but unmistakable

reaction of degeneration. His pupils acted feebly to light. There were no cranial nerve lesions. When he entered St. Bartholomew's Hospital on February 27 there was no ataxia, but since he had been in he had developed unsteadiness of gait. His abdominal reflexes were lively on both sides. He presented neither atropognosis nor astereognosis, but he did not seem to feel pin-pricks normally in the legs or trunk. He also had distinct hypotonia in the legs. The aspect of the case is suggestive of peripheral neuritis, but there was no history pointing to a cause of such. He lived in Essex and had his own well, the water from which had been analysed and found free from lead or other impurities. With regard to beer, he had a favourite tap from which he had his beer in town. A bottle of that had been sent for and carefully examined for arsenic, because the case looked more like one of arsenical neuritis than anything else. But the examination was negative. There was neither lead nor arsenic in the urine nor in the hair. The Wassermann reaction had been tried on both the blood and the cerebrospinal fluid, and was said to be negative in both, but he had 50 leucocytes to the centimetre, of which 94 per cent. were lymphocytes. He also had slightly increased globulin. Therefore there was a suspicion that, after all, it might be syphilis. The condition could not be progressive muscular atrophy. At a consultation at St. Bartholomew's Hospital most of his colleagues thought it was probably tabes, on account of the inactive pupils and the presence of some ataxia. If it were tabes it was an unusual manifestation of that disease. The patient considered that he was slowly improving as regards the power of the paralysed group of muscles.

The PRESIDENT thought it was a case of tabes, perhaps with neuritis superadded. The leucocytes in the cerebrospinal fluid, and the absence of a Wassermann reaction, with the sluggish and unequal pupils and the unsteadiness of the patient when the eyes were shut, pointed to that disease. It was a very unusual condition. The man also said he had had "sciatica."

A Case of Facial Spasm treated by Injection.

By HARRY CAMPBELL, M.D.

THIS case was of interest because the treatment adopted seemed likely to have cured a very troublesome condition. The spasm was limited to the muscles supplied by the facial nerve, involving all of them, including the platysma. It had lasted ten years. Dr. Campbell injected

the facial nerve and produced paralysis. He anticipated, on theoretical grounds, a good result. Severance of the facial nerve, he argued, would produce not only degeneration in the peripheral part of the nerve, but also in the central portion, involving the "nerve-cells" in the facial nucleus. There seemed no doubt that the essential trouble in this case was in the nucleus. He did not know of any other part of the nervous system a lesion of which would produce those peculiar symptoms. He argued that the retrograde degeneration might break the nerve-centre of its bad habit. The operation was done in October, and the power on the affected side was now gradually returning, and so far there had been no return of the spasm, except a slight flickering of the orbicularis. The patient's general condition was much improved; now that she was no longer worried by the constant spasm she would, indeed, have been quite satisfied even if she had had no recovery of the facial paralysis. The operation consisted of injecting the nerve with alcohol and eucaine in the ordinary manner.

Dr. FARQUHAR BUZZARD said that he had injected the facial nerve with alcohol in a similar case about five months ago and that the result had been perfectly satisfactory. He would like to draw attention to one interesting point. In his case the patient had been familiar with noises occurring in the corresponding ear whenever the face twitched, and these noises persisted at intervals for about a fortnight after the face had been paralysed by injection of the facial nerve at the stylomastoid foramen. Gradually, however, the noises died away and they had not returned. He was inclined to attribute the noises to contractions of the stapedius muscles which would naturally escape the effect of the injection, and which for some reason or other ceased after a time from carrying on the spasm by itself.

A Case of Persistent Hiccough.

By H. CRICHTON MILLER, M.D.

M. E. M. HAS complained of persistent hiccough since September, 1903. She was working for a while as a weaver amongst dangerous machinery. Two men were fighting, she heard somebody scream and imagined that someone had been caught in the machinery; she fainted, and is said to have been unconscious for twenty minutes, and when she came round she was hiccoughing. For six weeks she went about and

finally took to her bed in November, 1903. From January to May of 1904 she was in the Halifax Infirmary, where she received electrical treatment, and left very much worse. She improved slightly after leaving the Infirmary. She was three weeks in the Portrush Hospital and then five years at home; during one of those years she was on liquid food entirely. For three years, 1905-1908, the stomach-pump was used on alternate days. In September, 1908, she was again admitted to the Halifax Infirmary; had gastro-enterostomy performed for a constricted pylorus which would only admit a goose-quill. She was free for eight months, then another spell for six weeks, then free for six months. In February, 1910, she was again operated on in the Halifax Infirmary, but as it was found that the condition of the parts was satisfactory nothing was done. No improvement followed the operation. The present attack began in January, 1911, and has lasted fourteen months. In May, 1911, she was admitted to the Homœopathic Hospital, where she remained until February, 1912. The condition is made worse by exertion or emotion, and it does not cease when she holds her breath. It is described as a ball rising from the left hypochondria with pains passing through the left shoulder. She has generally one and occasionally two attacks during the twenty-four hours with severe exacerbation, but at all other times the hiccough is persistent. During a severe attack the hiccough will be as frequent as 210 per minute, and the attack may last from seven to ten minutes. Chloroform is the only thing that cuts them short, but before she is under the condition gets even more acute during the stage of excitement. The patient's history as regards other illnesses is as follows: Scarlet fever, whooping-cough and measles as a child. A gastric ulcer when she was 14, lasting eighteen months. Rheumatic fever in 1910. General condition of the vascular system normal, heart-beat synchronous with hiccough, reflexes normal, eyesight good, digestion always troublesome. A craving for sour fruit and aversion to sweets. Three or four stools daily. All teeth have been removed. Catamenia irregular. Patient has occasional severe occipital headaches. Suicidal tendencies have at times been very marked, but the patient is otherwise placid, cheerful and sensible; blood normal, Wassermann negative. T.B. said to have been found in the urine recently but not confirmed by further examination. Epithelium and blood present.

A Case of Syringomyelia.

By P. W. SAUNDERS, M.B.

(For J. RISIEN RUSSELL, M.D.)

E. F., A WOMAN, aged 40, a patient in the National Hospital under the care of Dr. Risien Russell, about seven years ago began to notice her back "growing out" on the right side, and consulted a doctor, on whose advice she got an instrument to wear to support her back. She has worn different instruments ever since. In herself she has felt well and been able to do her work as lady's companion more or less until quite lately, when she began to complain that her hands, especially the right, would get blue and cold when she was up and about. Also, recently, her arms have got quite weak and helpless, and have a heavy, dead feeling. Her back also is weak, so that she "drops to pieces" when her instrument is off. Her right leg, she thinks, may be a little weak. She passes her urine frequently. In all other respects her history is negative. She is a fairly well nourished and developed woman of about the age stated, and on examination presents the following positive points of note: There is a very slight nystagmoid jerking on lateral deviation of the eyes. In the upper limbs there is much wasting, some spasticity, and voluntary movements are very poor. In the trunk there is marked right scoliosis, with weakness of the muscles. In the legs there is no wasting, but slight spasticity, with spastic gait. Sensory changes are slight and somewhat indefinite. There is very slight hypæsthesia over the right arm and shoulder, and very slight hypalgesia over the right arm and shoulder and the right side of the trunk. There is fairly complete thermanæsthesia over the trunk, less complete over the left lower extremity and still less over the right lower extremity, while over the upper extremities there are only very occasional mistakes made, and these are more often made on the right side than on the left. The reflexes are present in the upper extremities, the triceps being brisk. The abdominal reflexes are absent. The knee-jerks and ankle-jerks are very brisk, with clonus. The plantars are extensor.

[Besides the signs in the nervous system, there is a well-marked fine systolic thrill and harsh, loud systolic bruit very localized at the pulmonary area.]

Neurological Section.

May 9, 1912.

Dr. F. W. MOTT, F.R.S., President of the Section, in the Chair.

Pathological Changes in Voluntary Muscles in General Diseases.

By REGINALD C. JEWESBURY, M.D., and W. W. C. TOPLEY, M.B.

INTRODUCTION.

THE subject of our investigation has been the pathological changes in voluntary muscles in various general diseases, and we have purposely avoided the examination of muscles affected as the result of nervous lesions, with the exception of a very few cases, since this has already been fully dealt with by neurologists and others.

We were prompted to undertake this piece of work, since comparatively little seems to have been done on it by people in this country, and in foreign literature, with the exception of one or two writers, we have been unable to find very much concerning the changes which may occur in muscle in general conditions.

We propose to bring before you this evening a short abstract embodying the most important of our results. The full account of our work we hope to publish elsewhere. It would greatly increase the length of this paper without adding appreciably to its interest, did we attempt to summarize all the results obtained by other workers, but we are in no way unmindful of them, and we shall refer to them briefly under the various sections dealt with where they can be placed directly in comparison with our own.

Our work has been carried out in the pathological departments of St. Thomas's and Charing Cross Hospitals. We have investigated the histological changes in muscles from 153 different cases, including both

those from human subjects and from animals, which had been experimented upon. In all cases we have confined our attention to voluntary muscles. As a routine we have made sections from the biceps, rectus abdominis, and pectoralis major in each human case. In a very few cases other muscles were also examined. In all cases the muscles were fixed in formalin and cut in celloidin, since this was found the most satisfactory method, and the sections were stained with hæmalum and eosin. Other methods of cutting and staining will be referred to later.

For convenience of description we propose to deal with the subject under the following headings:—

- (1) Muscle in wasting diseases.
- (2) Muscle in acute diseases.
- (3) Fatty changes in muscle.
- (4) Glycogen in muscle.
- (5) Amyloid changes in muscle.

MUSCLE IN WASTED AND CACHECTIC CONDITIONS.

Muscles from forty-five cases were examined, all of which showed more or less wasting. The cases examined were as follows:—

	Cases
Malignant disease	19
Chronic pulmonary tuberculosis	4
Diabetes mellitus	2
Marasmus	1
Actinomycosis	1
Exophthalmic goitre	1
Prolonged suppuration	1
Chronic metal poisoning	1
Tuberculous meningitis	1
Ulcerative colitis	1
Cirrhosis of liver	1
Spina bifida	1
Pernicious anæmia	1
Paraplegia	1
Perigastric fistula with pulmonary tuberculosis	1
Animals (experimental)	8
	<hr/> 45

It has been found that, on the whole, most of the more wasted muscles to the naked eye show well-marked changes microscopically, but this cannot be by any means laid down as a rule, for there have been several cases in which, although macroscopically the muscles were markedly atrophied, the sections showed practically a normal condition. Nor can it be foretold from the naked-eye appearance of the muscle what kind of change is likely to be met with under the microscope—

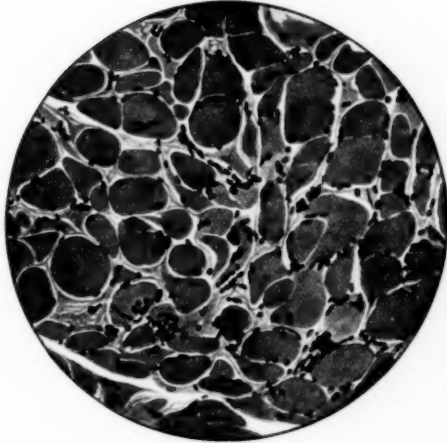


FIG. 1.

Muscle from a case of chronic pulmonary tuberculosis, showing the increase of fibre nuclei and their aggregation into darkly staining masses.

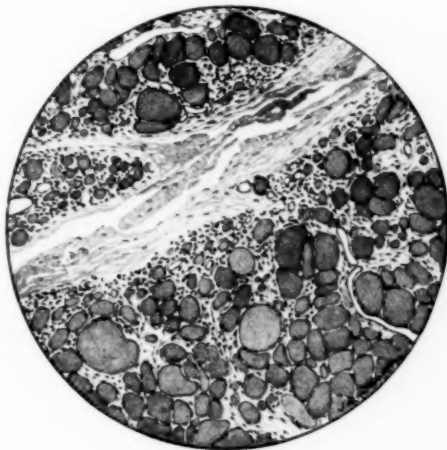


FIG. 2.

Wasted muscle showing variation in shape and size of fibres. Increase of interstitial tissue and presence of large pale-staining fibres.

i.e., whether the fibres, interstitial tissue, &c., are likely to be affected, the one more than the others.

With regard to the muscle-fibres themselves, they have been found to show marked alterations in shape, size, and staining reactions, and, on the whole, these changes have been especially marked in the more wasted cases. Almost every variation from the normal cylindrical shape of the fibres was present. The size of the fibres varied to a similar degree. In many sections there were some very large isolated fibres, which took a very much paler stain than their neighbours. The above changes are well shown in figs. 1 and 2.

The diameter of the fibres in cross-section has been measured by means of the micrometer in a large number of sections; fifty fibres were measured in each section, and the largest and smallest noted. The average taken in each section does not satisfactorily express the real variations in the size of the individual fibres. In normal muscle the size of the fibres was found to vary between $13.3\ \mu$ and $33.3\ \mu$, the normal average being $23.6\ \mu$. The muscles measured in each case were the pectoralis major, biceps, and rectus abdominis. There was very marked variation in the size of the fibres in the muscles of this group of cases.

In the majority of the very wasted muscles a marked feature is the large increase of the nuclei. The true relationship of these nuclei to the muscle-fibres has been somewhat difficult to determine, owing to the extreme peripheral position of the nuclei in the fibres, but the examination of several preparations of teased muscle seems to prove that the majority of these nuclei lie beneath the sarcolemma, and so belong really to the fibres rather than to the interstitial tissue. This increase of nuclei was seen in thirty out of the forty-five cases comprising this group. Another marked change connected with the nuclei in several cases was their arrangement; they were found to be aggregated into irregular, darkly staining masses, and, for the reason mentioned above, we considered that these were the actual fibre nuclei. This change was present in nineteen of the cases, and is shown in fig. 1. Some sections show the nuclei arranged in irregular masses near the periphery of the fibres, and these fibres show a considerable amount of hyaline change and their striation is indistinct, the whole in transverse or oblique section closely resembling multinucleated giant cells, such as are seen in tuberculosis and certain chronic inflammatory conditions. False giant cells of this type are shown in fig. 3. Many of the above changes have been already observed by Durante and others. In two

cases certain of the nuclei were placed at or near the centres of the fibres instead of at the periphery.

In many cases abnormality in striation of the fibres was a marked feature, the transverse striation was often very indistinct and sometimes absent, and in others a longitudinal striation was in evidence. In twenty-five out of the forty-eight cases examined there was a very noticeable increase of the connective tissue. This is seen in fig. 2. In two instances, one a case of carcinoma of the breast and one of exophthalmic goitre, small lymphorrhages were noticed.

In the cases examined it does not appear that any one particular voluntary muscle is more liable to any special change in wasting con-

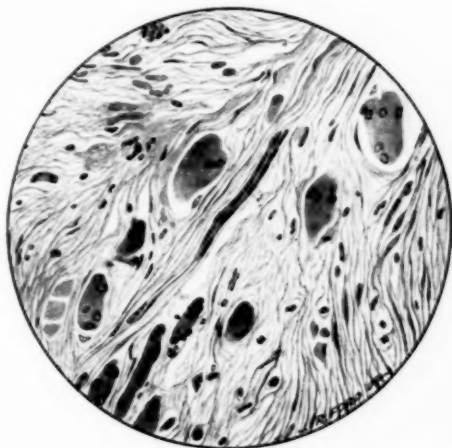


FIG. 3.

Muscle undergoing fibrosis, showing the presence of pseudo-giant cells.

ditions than other muscles in the same individual. For instance, sometimes the rectus will show the most marked changes, whereas in other cases of the same disease the biceps may be the muscle most affected.

MUSCLE CHANGES IN ACUTE DISEASES.

The changes which have been described in voluntary muscles in acute diseases, especially by Durante, consist mainly in the *hyaline* and *granular degenerations*, *irregularities in size and shape of the fibres*, some degree of *multiplication of the nuclei*, and less commonly *fragmentation* and *vacuolar degeneration*.

We have examined the muscle from forty-two cases of acute disease. In twenty-four of these no change of any kind was noted; in the remaining eighteen cases the changes were for the most part extremely slight and consisted mainly of a certain amount of hyaline and granular degeneration. In four of these eighteen cases the muscles showing the above changes were the seat of acute inflammation themselves. Eight cases were either those of diphtheria in the human subject or animals in which diphtheritic toxæmia had been experimentally produced. The changes noted in these cases will be dealt with in the section relating to fatty degeneration. Four cases were those of animals poisoned by phosphorus; two of these showed marked fatty degeneration and will also be described more fully in the next section. Thus, there only remain six cases of acute general infection showing any change in the voluntary muscles. In a rabbit dying from a pneumococcal infection all the muscles showed some degree of fatty degeneration, and several fibres in these sections were also hyaline. Five other cases of animals dying from a pneumococcal infection, also one case of broncho-pneumonia, one of lobar pneumonia, and two cases of empyema in the human subject, were examined without finding any change. Three guinea-pigs and one rabbit died from an acute infection with the *Bacillus proteus*. The muscles of the rabbit showed a marked degree of hyaline and granular change; the muscle of one of the guinea-pigs showed in every section a few granular fibres; those from the second guinea-pig presented a marked degree of fatty degeneration; those of the third guinea-pig were slightly granular, but there was no fatty change. The muscles of a guinea-pig which had died as the result of an acute infection with the vibrio of chicken cholera exhibited a slight granularity. Thus, no case of acute disease in the human subject, except three of diphtheria, showed any abnormality.

FATTY CHANGE IN VOLUNTARY MUSCLE.

One hundred and twenty-six cases were examined for fat. They include examples of various kinds of acute and chronic conditions. Sections of the muscles were cut on the freezing microtome, stained with Scharlach R, and counterstained with hæmalum. We deal with this subject under the following headings:—

- (1) Changes in the amount of interstitial fat.
- (2) Presence of fat droplets and pigment in the neighbourhood of the muscle-fibre nuclei.
- (3) True fatty degeneration of muscle.

(1) *Interstitial Fat.*

In normal muscle there is, as a rule, very little fat in the interstitial tissue, in many sections none at all may be seen, or at most a few fat cells lying near the vessels—i.e., in those places where the interstitial tissue is relatively considerable in amount. In a few sections collections of fat cells were seen lying between the individual muscle-fibres, but this is not often met with.

We found the fat cells lying between the fibres to be enormously increased in the following cases, and the increase was so marked that



FIG. 4.

Muscle from case of diabetes, showing excessive amount of interstitial fat.

it was readily seen in the stained sections with the naked eye, and microscopically was most striking. Fig. 4 illustrates this from a case of diabetes. It has been found excessive in :—

	Cases
Diabetes mellitus	9
Senile gangrene with glycosuria	2
Pancreatic lesions (carcinoma 2, fibrosis 1)	3
Cirrhosis of liver (Cambridge +)	1
Mastoid abscess	1
Diphtheria	1

The interstitial fat was also increased in nine other cases, but to a much less marked extent than in the above. One case of diabetes

failed to show an excessive amount of fat, but this was the only exception.

The total fat in the muscle was measured in several cases by means of Soxhlet's ether apparatus; the accompanying table shows the percentage of fat in the dried muscle. This list clearly shows that the muscles of diabetics, and probably those from cases of gangrene associated with glycosuria, possess an abnormally large amount of interstitial fat. The quantitative estimation of fat was only undertaken as a means of controlling the histological findings, and was not meant as an incursion into the field of chemical pathology. Dr. Paul Haas has very kindly given us some valuable help in connexion with this part of our work.

PERCENTAGE OF FAT IN DRIED MUSCLE.

<i>Group I.</i>						Per cent.
Diabetes mellitus (5 cases)	...	...	...	...	...	26.44
	...	...	...	...	...	38.58
	...	...	...	...	...	13.65
	...	...	...	...	...	41.13
	...	...	...	...	...	10.66
Senile gangrene with glycosuria (2 cases)	...	...	...	...	...	32.10
	...	...	...	...	...	34.23
Average	...	...	...	...	...	28.11
<i>Group II.</i>						
Carcinoma of pancreas ...	...	...	...	...	...	13.10
Cirrhosis of liver ...	...	...	...	...	...	20.56
Average	...	...	...	...	...	16.83
<i>Group III.</i>						
Mastoid abscess ...	...	...	...	...	...	10.00
Cardiac failure ...	...	...	...	...	...	6.13
Carcinoma of stomach ...	...	...	...	...	...	8.45
Actinomyces ...	...	...	...	...	...	3.06
Carcinoma of oesophagus ...	...	...	...	...	...	14.72
Diphtheria ...	...	...	...	...	...	12.00
Chronic pulmonary tuberculosis ...	...	...	...	...	...	12.00
Myasthenia gravis ...	...	...	...	...	...	25.00
Average	...	...	...	...	...	11.42

(2) *Fat and Pigment near the Nuclei.*

In a fair proportion of our cases we found near the muscle nuclei, and situated mainly at their poles, coarse fat droplets. This gave the muscle an appearance somewhat like that seen in cardiac muscle in the condition known as brown atrophy, although of course in these cases it is well known that the condition is due to pigment and not

to fat. In our cases small quantities of brown pigment as well as fat were sometimes found to be present. Fig. 5, taken from a case of carcinoma of the œsophagus, illustrates this condition.

The above change was seen in 50 per cent. of the cases examined, and it is doubtful whether it has any pathological significance. It is almost constant in the muscles of old people, rare in children, and was only found in a very slight degree in one out of thirty-eight animals examined.

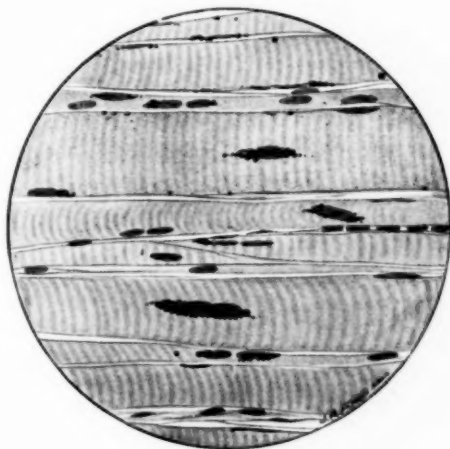


FIG. 5.

Muscle from a case of carcinoma of œsophagus, showing the presence of fat and pigment at the ends of the nuclei.

(3) *True Fatty Degeneration in Muscle.*

This condition is said to be commonly met with by several foreign authorities; Durante, in Cornil and Ranvier's "Manual of Pathological Histology," says that it occurs in general infective diseases, after poisoning by phosphorus and arsenic, in muscles which have been subjected to pressure by tumours, &c., also in infective myositis, myelopathies and myopathies; but he apparently denies that it may occur as a result of peripheral nerve lesions, and he therefore thinks it is a process due to the result of cachexia or of the general infective disorder rather than to the actual amyotrophic process. Lorenz draws attention to a granular degeneration and thinks that the granules are first protein in character and later become converted into fat. Others have stated that fatty

degeneration commonly occurs in wasted muscles in chronic pulmonary tuberculosis and in various other conditions.

In this our results differ considerably from those of other workers. In five cases of chronic pulmonary tuberculosis examined it was found only once, and then only in two fibres of one of several sections taken from the pectoral muscle. In twenty-five cases of malignant disease it was found only once in a single fibre of one section from the rectus abdominis. In one fibre of a muscle from a case of cardiac failure. In one out of ten cases of diabetes a few fibres in most of the sections showed this change. A case of slowly progressive paralysis of unknown origin¹ involving all the muscles of the body, and ending in paralysis of the bulbar type with resulting broncho-pneumonia, showed some degree of fatty change in all sections. The acutely inflamed pectoral muscle of a rabbit which had received an intrapleural injection of a virulent culture of the pneumococcus showed a few fibres presenting this type of degeneration. The muscles of another rabbit dying as the result of an acute pneumococcal infection showed a slight degree of this change. We have examined a large number of muscles which were the seat of acute inflammatory change, and also the muscles from a considerable number of rabbits, guinea-pigs and mice dying from pneumococcal infection, and four cases of pneumococcal infection in the human subject, but have never found true fatty degeneration present except in the above two cases. In all these cases the fatty change was a very slight one; but in a certain proportion of the cases examined an entirely different condition obtained. True fatty degeneration was present in a most marked degree, obvious in the majority of the fibres in all sections examined, and presenting an appearance quite comparable to that seen in cardiac muscle in acute diphtheritic toxæmia. The muscle of a girl dying of a severe anæmia, which did not conform to any recognized type, showed this change to a marked degree; and also to a still greater extent did the muscles obtained from a case of infective purpura; one of these muscles is shown in fig. 6. On the other hand, two cases of pernicious anæmia, one of acute lymphæmia, one of myelæmia and one of lymphadenoma presenting the severest possible type of secondary anæmia, showed no trace of this change.

Following these results an attempt was made to determine the effect of the injection of a specific hæmolysin into a guinea-pig. Two experiments were performed; in one of these marked fatty change was

¹ For the inclusion of this case we are indebted to the kindness of Dr. Turney under whose charge the patient was during life.

produced in the soleus and anterior thigh muscle. Three cases of diphtheria in the human subject were examined. Of these one showed the enormous increase of interstitial fat alluded to above, but no other change. The other two cases, in which the interstitial fat was normal in amount, showed true fatty change in a marked degree.

Following these observations we examined the voluntary muscles of certain animals dying as the result of inoculation with diphtheria toxin and with cultures of the diphtheria bacillus. To summarize briefly the results, we may say that in animals dying after an interval of less than twenty-four hours, fatty change in the voluntary muscles is very rare ;

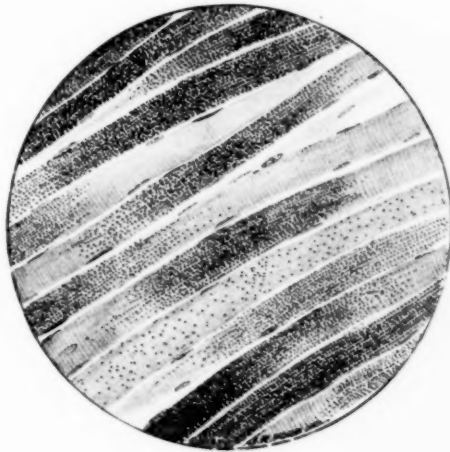


FIG. 6.

Section from case of infective purpura in a girl aged 19, showing well marked true fatty degeneration.

but in the case of animals dying after a longer interval, it is almost constant.

In this connexion we would recall Dudgeon's experiments as described in his contribution on the "Pathology of Acute Diphtheritic Toxæmia."¹ In the course of his investigation he examined the tissues of many animals dying as the result of experimental inoculation with diphtheria toxin. In a few of these, sections of the voluntary muscles were examined, the results being uniformly negative. In all these cases, however, the inoculated animals died within twenty-four hours, and

¹ *Brain*, 1906, xxix, pp. 227-64.

thus the results are in close agreement with the experiments noted above, in which two guinea-pigs dying within eighteen hours after inoculation showed in one case no fatty change in the voluntary muscles, in the other only the very slightest degree of such change.

Sidney Martin records a case of a man, aged 19, dying from diphtheria on the twenty-seventh day of disease, in which the right and left vasti muscles and the palatal muscles showed scattered fatty change.

Mallory describes two cases of diphtheria in the human subject in which the skeletal muscles showed fatty change, and gives a plate showing the condition in the psoas magnus in one of them. He does not, however, state the duration of the illness in either case.

We have also subjected guinea-pigs and mice to the action of phosphorus given by inoculation and by the mouth, and examined the voluntary muscles for fatty change, at the same time staining sections of the liver and cardiac muscle in certain of the cases as controls. In two animals in which death occurred within twenty-four hours the voluntary muscles showed no fatty change, but a mouse which died on the fourth day after receiving repeated doses of phosphorus showed well-marked fatty change in all the voluntary muscles examined.

In view of the exhaustive studies undertaken by Panton we did not consider it necessary to investigate the effect of arsenical poisoning.

The skeletal muscles obtained from a case of myasthenia gravis, which were forwarded to us from the National Hospital, Queen Square, and for which we are indebted to the kindness of Dr. Farquhar Buzzard and Dr. Hinds Howell, showed a marked degree of true fatty change.

In view of the suggestions put forward by Farquhar Buzzard as to the part played by the red and pale muscle-fibres respectively in this disease, we endeavoured to discover whether the red muscles in those animals in which fatty degeneration of the skeletal muscles had been experimentally produced showed any special susceptibility to this change. We were, however, unable to satisfy ourselves that any such difference between the two kinds of muscle existed.

Dealing now very shortly with the suggested relation of the presence of fat droplets in the immediate neighbourhood of the nuclei to true fatty change, we may say at once that we have been quite unable to satisfy ourselves that any such relationship exists. Durante, as stated above, considers that this nuclear change is the precursor of a more general fatty degeneration affecting the whole fibre, but we have found no evidence of this. It is true that certain sections which show the one change show the other also, but considering the frequent occurrence of

the nuclear fat droplets this is to be expected. The following facts appear to us to prove the entire independence of the two processes :—

(1) The nuclear collections of fat are of frequent occurrence (50 per cent. of the cases examined). True fatty change is, however, very rare. Were the one change only an early stage of the other this marked disproportion would be very remarkable.

(2) The occurrence of nuclear fat was no more frequent in those cases showing true fatty degeneration than in the cases in which this change was absent.

Thus in those cases which occurred in adults a large proportion showed this change. In the cases in which true fatty change occurred in the muscles of young adults or children, the nuclear collections of fat were absent or only very slightly marked. In no case did the muscles of an animal in which fatty change had been experimentally produced show these collections. In some cases in which fatty change has occurred in the muscle-fibres we have noted the occurrence of fat phagocytosis by mononuclear cells.

GLYCOGEN IN MUSCLE.

Thirty-five cases were examined for the presence of glycogen granules in the muscle-fibres by Best's carmine method of staining. In each case the muscle was obtained fresh from the operating theatre at the time of operation, or in the case of animals immediately after death. Of these cases, glycogen granules were found present in the fibres in eleven instances, and were absent in the remaining twenty-four.

The results obtained (with one exception) do not admit of any conclusion being drawn as to the effect of disease on the presence or absence of glycogen granules in voluntary muscle-fibres. The exception referred to is the following: The leg muscles were obtained immediately after amputation from three cases of diabetic gangrene: in all of these a very marked excess of glycogen was present, but the small number of cases examined does not allow of any generalization being made. In many of the experimental cases on animals the liver was treated by the same method, and examined as a control, and in all sections showed the presence of glycogen. The distribution of glycogen granules in different fibres of the same muscle was noted to be exceedingly irregular, thus one fibre showed the presence of a large amount of glycogen, whilst in neighbouring fibres it was often entirely absent. This same irregularity was also noted in regard to the different muscles themselves from the

same case—one muscle might be found to contain glycogen while in another it was absent. It is not to be supposed that the presence or number of glycogen granules shown by this method of treatment affords an accurate indication of the actual amount of glycogen present in the muscle-fibres.

AMYLOID DEGENERATION IN MUSCLE.

Twelve cases were examined for the presence of any amyloid change, methyl violet being used as a stain; in all of these it was completely absent.

CONCLUSIONS.

(1) In wasting diseases the voluntary muscles show varying degrees of histological change bearing little relation to the actual degree of wasting present. These changes consist of alterations in the size, shape, and staining reactions of the fibres, increase in the fibre nuclei, and alteration in their arrangement, sometimes resulting in the production of false giant cells; and lastly of a relative increase of the interstitial tissue.

(2) In acute general diseases, muscle changes are extremely slight, consisting of some degree of hyaline and granular change, and in a certain small number of cases of fatty degeneration.

(3) Fatty changes. In certain disorders associated with an abnormal carbohydrate metabolism, there is a great increase in the amount of interstitial fat present. In many cases small collections of fat droplets are present in the neighbourhood of the fibre nuclei; these are common in advanced life, rare in children, and almost entirely absent in animals. They bear no relation to true fatty degeneration, and it is doubtful if they have any pathological significance. True fatty degeneration appears to be much less common than is usually stated, but occurs to a marked degree in cases of diphtheritic toxæmia, in certain blood disorders, and in poisoning by phosphorus.

(4) Glycogen. Of the many muscles stained for glycogen, it was only strikingly present in each of the three cases of diabetes examined.

(5) Amyloid change was not found in any case examined.

It only now remains for us to acknowledge our great indebtedness especially to Dr. L. S. Dudgeon, at whose instigation this work was undertaken, and whose help and advice throughout have been invaluable, and also to many others for their kind suggestions and assistance in providing us with material.

DISCUSSION.

Dr. F. E. BATTEN said he felt great admiration for the work the authors had done. He had examined muscle from children, the subjects of advanced tuberculosis in whom there was considerable wasting, and he would agree that there was a comparative increase in the interstitial tissue. But it always seemed to him that that increase of interstitial tissue was not a real but only a relative increase, owing to the wasting of the fibres; an entirely different condition from that met with under pathological conditions, such as the myopathies, where a true increase of the tissue was found. The authors exhibited a specimen that evening which he did not think they alluded to in their paper—namely, a muscle taken from a patient who was suffering from sarcoma. That muscle was a most peculiar one, and was in a condition which he did not think he had ever seen before. He thought that that muscle was infiltrated by some form of growth, and that it was not a condition merely secondary to growth elsewhere in the body. It might be argued that the cells in the interstitial tissue were not the cells of sarcoma; they might, however, be an inflammatory exudation between the fibres. He would like to hear what other members thought of that specimen.

Dr. FARQUHAR BUZZARD said he was no better able to criticize the paper than many of those present, as it was full of work carried out in a field of investigation which few had entered. Like Dr. Batten, he had investigated much muscle tissue, but chiefly in connexion with neurological conditions, and he had always found some difficulty in deciding how far muscle changes might be regarded as secondary to neurological processes, and how far they represented primary alterations in the muscles themselves. The paper they had heard would enable them to form better ideas on this question. So far as his own experience of investigations along these lines was concerned, he had found that in acute diseases generally the heart and diaphragm were more subject to fatty degeneration than the skeletal muscles. This result suggested that the fatty degeneration was not so much the result of the acute disease as the result of muscular action being continued right up to the moment of death under conditions which were unfavourable to normal metabolism. At any rate, the absence of changes in the skeletal muscles, which are kept at rest, suggests this interpretation. The authors alluded to another point—namely, the difference between their observations and those of other workers as to the prevalence of fatty degeneration. This difference might possibly be explained if it were shown that the other investigators had used the osmic acid method instead of the Scharlach stain used by the authors of the paper. It had been fairly well established that the two methods gave somewhat different results.

The PRESIDENT (Dr. F. W. Mott, F.R.S.) said that some years ago he was interested in the subject of the condition of muscle in disease, especially in association with general paralysis of the insane, in which disease great wasting

took place. But he was surprised to find there was very little change in the muscle-fibres, beyond an atrophic condition, a pallor of the fibres, and a little indistinctness of striation. But if the patient had had a series of fits, a very different condition of muscle was found. If the fits had been universal, there was found extensive fatty degeneration of muscle-fibres in all the muscles of the body, and the extent of that degeneration was proportional to the number of fits which the patient had had. He found also fatty degeneration of the heart muscle, but not so marked as in the voluntary muscles. This condition was also marked in the diaphragm. He found the same state of things present in status epilepticus, but he was doubtful whether this might not be due to the condition which caused the status epilepticus, or the fits in general paralysis; because he soon found that in general paralysis, as a rule, when the patients had fits they had some terminal or secondary microbial infection—pneumonia, broncho-pneumonia, or dysentery, which raised the temperature. So that there was a double cause; there was a condition of over-action of the muscle, or at least continual action of muscle under stress, conditions which would prevent the restoration of the substance used up. And the problem was a difficult one because many of these patients in whom he found fatty degeneration with status epilepticus, died with a temperature of 107° or 108° F. Still, he had seen cases die with very high fever and with marked changes in the nerve cells, as in status epilepticus, but if they did not have the fits they did not show fatty degeneration. Therefore he concluded that the continuous contraction of the muscles had something to do with the fatty degeneration. Dr. Buzzard had somewhat anticipated the remarks he had intended to make about the diaphragm. He had found that in pernicious anemia and other diseases, as he said in his Croonian Lectures, the diaphragm of guinea-pigs poisoned with the toxin of *Bacillus botulinus*¹ showed fatty degeneration, although he found none in the skeletal muscles. And for the same reason he thought it was because the animal lay at rest, but would have to use its diaphragm two or three times as rapidly as under normal conditions. He therefore thought that excessive exercise in the muscles played a part in the fatty degeneration, and he suggested it would be well if the authors could undertake some experiments, such as those of Edinger, with regard to the effect of toxins and excessive exercise in animals in causing degeneration of the posterior columns. If they were to poison rats and then put them into a rotary cage in which they had continually to move, no doubt fatty degeneration would be found in their muscles. He also suggested that the authors should try the effect of carbon monoxide, because he thought the deficiency of oxygen might play an important part in connexion with these changes. One interesting fact in connexion with the muscles of general paralytics would interest Dr. Batten—namely, that he found muscle spindles beautifully intact in some of these cases where there was marked fatty degeneration of the other muscles. That was also rather in favour of the effect of excessive exercise being a factor in the production of

¹ *Brit. Med. Journ.*, 1900, i, p. 1588.

fatty degeneration. He was showing that evening specimens of a case of a man who had over 500 unilateral epileptic fits in three days. He did not discover what was the cause of the fits; they were unilateral, on the right side; and there was most extensive fatty degeneration of the muscles. He only took out for examination a piece of the thumb muscle on the right side and a piece from the left, and the difference was extraordinary. He found also most extensive fatty degeneration of the diaphragm, and some fatty degeneration of the heart; also, as he had found in cases of status epilepticus before, the convoluted tubules of the kidney contained large quantities of fat in the epithelium, as if the fat had got into the circulation and had been picked out from the blood by the epithelium of the convoluted tubules, leaving the glomeruli perfectly free. The case was interesting as supporting the idea he had entertained, that the fatty degeneration in status epilepticus was not due to the microbial infection or the fever, but was due mainly to the excessive activity under unfavourable conditions. He congratulated the authors upon this valuable piece of work; it was the kind of spade-work which was required, and it would be of great value to all who might go into the subject later to find what conclusions were deducible from the work of Dr. Topley and Dr. Jewesbury.

Dr. F. PARKES WEBER asked whether the authors had been able to bring out any relationship between prolonged disuse of skeletal muscles, such as in the case of a bedridden patient, and excess of interstitial nuclei (interstitial connective tissue elements) in the skeletal muscles.

Dr. TOPLEY, in reply, said that, with regard to Dr. Batten's remarks, they quite agreed that the apparent increase of interstitial tissue was in most cases much more a relative than a real increase, since the muscle-fibres themselves had atrophied. The most marked exception was the case Dr. Batten referred to. The patient had generalized sarcoma. The two muscles examined were the pectoral and the rectus abdominis, and there was no growth anywhere in the neighbourhood of either of those muscles.

In answer to Dr. Buzzard, they felt sure that if they had examined the heart and diaphragm in all their cases they would more often have discovered fatty degeneration, but they had purposely left out those muscles because they had so frequently been examined by others. The great difference between the heart and diaphragm and the voluntary muscles was a most striking point. With regard to the methods employed by others, they thought that almost all the workers referred to used osmic acid as a stain. Dudgeon had shown conclusively, in his contribution on the pathology of acute diphtheritic toxæmia, that the fine fatty change occurring within twelve hours in the cardiac muscle was, in many cases, well shown by Scharlach R, but not by osmic acid. The two stains certainly appeared to pick out different substances in some cases.

Dr. Topley exhibited a list showing the percentage of total fat in the voluntary muscles in a series of cases. The average in cases of true diabetes and of glycosuria with gangrene was 28.11 per cent. of the dried muscle.

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In two other cases, one of cirrhosis of the liver, which during life gave a positive Cammidge reaction in the urine, and one of carcinoma of the pancreas, it was 18.3 per cent., whereas in eight other cases the average percentage was only 11.42.

They had not examined the tongue in any of their cases. They had examined only two cases of pernicious anæmia, neither of which showed any fatty change in the voluntary muscles. They had been most interested in the very instructive cases described by the President. The only case in their series which was at all comparable was one of acute tetanus, in which there was no fatty degeneration in any muscle examined. They had not had an opportunity of examining a case in which rapidly recurring fits had occurred shortly before death. They had examined several cases, in which pyrexia had been a marked feature, but they showed no sign of fatty change. So that Dr. Mott's suggestion that the muscle changes were due to exhaustion seemed the more likely.

In answer to Dr. Parkes Weber, a certain number of the cases examined had suffered from prolonged illness involving continued rest in bed, but they had not examined the muscles of patients who had been at rest for long periods, as contrasted with those who had not.

The Changes in the Central Nervous System resulting from Thyro-parathyroidectomy.

By WALTER EDMUNDS, F.R.C.S.

THE effects produced on the nervous system by the excision of the thyroid and parathyroid have been described by various observers. In 1902 I communicated to the Pathological Society a paper on the effects produced by thyroid excision and by thyroid feeding [1]. The experiments there related included three in dogs in which thyro-parathyroidectomy had been performed. These three dogs died, or were killed because they were about to die, one in three, one in six, and one in twelve days. This is the usual result of this operation, for under usual conditions carnivora generally die a few days after the operation, only about 4 per cent. surviving. It has, however, been pointed out by W. G. MacCallum and Voegtlin [3] and others that if these dogs are treated with calcium salts in large doses a considerable number of the animals will survive the operation, with or without symptoms during the first few days. Experiments to test this have been performed by myself both on dogs and cats and the results published [2]; in dogs there was a recovery of 45 per cent., and a similarly good result was obtained in cats, the animals surviving many months. These results were obtained by giving calcium as lactate, either by the mouth or intravenously, or by feeding the animals with milk (which contains much calcium).

On the previous occasion the experiments were made at the Brown Institution, and the nervous systems of the animals were, by kind permission of Dr. Mott, examined at the Pathological Laboratory of Claybury Asylum, and the same has been done on the present occasion. Although the animals when treated with calcium survive the operation several months, they do eventually die as a result of it. Of the three animals in which the changes about to be described occurred, the two cats survived seven months each and the dog four and a half months. I have at the present time a dog living on milk and in good health which was operated on thirteen months ago.

The dog whose nervous system was examined was fed on milk, a quart a day, and was given in addition 30 gr. (2 grm.) of lactate of calcium a day; then it was submitted to total excision of the thyroid and parathyroids. The day but one after the operation the dog had

severe tremors; 9 gr. (0.6 grm.) of lactate of calcium were given intravenously. The next day the dog was nearly well; he was running about and seemed quite bright. He continued well (on milk diet) for four months and eleven days after the operation, then the gait was affected and the hind limbs seemed stiff; there was no sugar in the urine. The next day the dog seemed dull, ran about only slowly, and could not jump up on his hind legs. Two days later the dog died. The post-mortem, which was made about three hours after death, did not show any changes to the naked eye; the brain and cord were put into a 5 per cent. formalin solution.

Cat No. 1.—This cat was fed on normal goat's milk; it then underwent total excision of the thyroid and parathyroids, and did well for two months, when it had an attack in which it seemed stupefied and breathed rapidly; there was no sugar in the urine. From this attack the cat recovered and remained well till seven months after the operation; the animal then had an altered gait and walked with its legs apart. The next day the animal was worse and could hardly stand, and was destroyed by chloroform; the brain and cord were at once removed and placed in a 5 per cent. formalin solution.

Cat No. 2.—The cat was fed for some days on milk only; it was then subjected to total excision of the thyroid and parathyroids; it was then given, in addition to the milk, 30 gr. a day of lactate of calcium. The cat had no symptoms, except that in four months' time it was thought to be somewhat thin. Six months after operation the cat had an attack in which it seemed very dull and did not take its milk properly; the attack passed off and the cat remained fairly well for a month, when it had another similar attack; there were no tremors on either occasion. The next day the cat, being no better, was destroyed by chloroform; the brain and cord were at once taken out and placed in a 5 per cent. formalin solution.

It will be noticed that the two cats were destroyed by chloroform; they did not require much, as they were very ill at the time. In order to avoid any source of fallacy arising from this, a normal cat was killed by chloroform and its brain and cord treated in the same way and used for comparison. The dog died of the symptoms.

After hardening, the portions were embedded in paraffin and cut. The changes about to be described were shown by staining by the Nissl method; sections were also stained by the Ranke method, but they showed no glial proliferation; also by the Weigert-Pal method, but they showed no tract degeneration, also those stained by the Marchi method did not show any fatty degeneration.

DESCRIPTION OF SPECIMENS.

Cat No. 1.—Spinal cord: The changes are most marked in the medium-sized and smaller cells; in many of these the body is partly or wholly destroyed. In the cell drawn it will be seen that the Nissl bodies are undergoing chromatolysis: the nucleus is destroyed and the cell is invaded by satellite cells, which are seen in the body of the cell; the upper cell is not so far advanced towards destruction. Medulla: Changes similar to those in the spinal cord are found in all the cells of the medulla, though not so marked. Cerebellum: The cells of Purkinje also show changes similar to those found in the cord. Cortex: The medium and large pyramidal cells exhibit the following changes: in many the Nissl bodies are undergoing chromatolysis, while many others are utterly destroyed, only the outline of the cell being visible; many of them are being invaded by satellite cells.

Cat No. 2.—Spinal cord: Shows similar changes to those described in Cat No. 1 (*see fig. 1*). Medulla: Shows similar changes in its cells (*see fig. 2*). Cerebellum: The cells of Purkinje are seen in all stages of destruction. Cortex: Similar changes to those found in Cat No. 1. The pituitary body was examined, but no changes found.

Dog No. 1.—Spinal cord: The cells, both large and small, are affected, the changes being even more marked than in the cats; many of the cells are nearly totally destroyed and quite past regeneration. Many of the cells are far more destroyed than those shown in the drawings, which represent an average group. Medulla: There are some changes, but they are not so advanced as those seen in the cord. Cerebellum: There are the same changes as those described in the cells of Purkinje in the cat. Cortex: Cell body is swollen; the Nissl bodies are undergoing chromatolysis; in some cells the nucleus and nucleolus have disappeared, as shown in the drawings. Pituitary: No change can be detected (*see fig. 3*).

The percentage of calcium in a portion of the brain of the thyro-parathyroidectomized dog, and also for comparison in a portion of the brain of a normal dog, was kindly determined by Mr. Mann, the chemist at Claybury. He found as follows:—

NORMAL DOG'S BRAIN.

Reduced to ash	...	...	...	...	0.2376 grm. ash
From which ...	...	...	...	...	0.0036 " CaO
					= 1.5 per cent. of CaO in ash.

THYRO-PARATHYROIDECTOMIZED DOG.

Reduced to ash	...	...	...	...	0.2192 grm. ash
From which ...	...	...	...	...	0.0015 " CaO
					= 0.7 per cent. of CaO in ash.

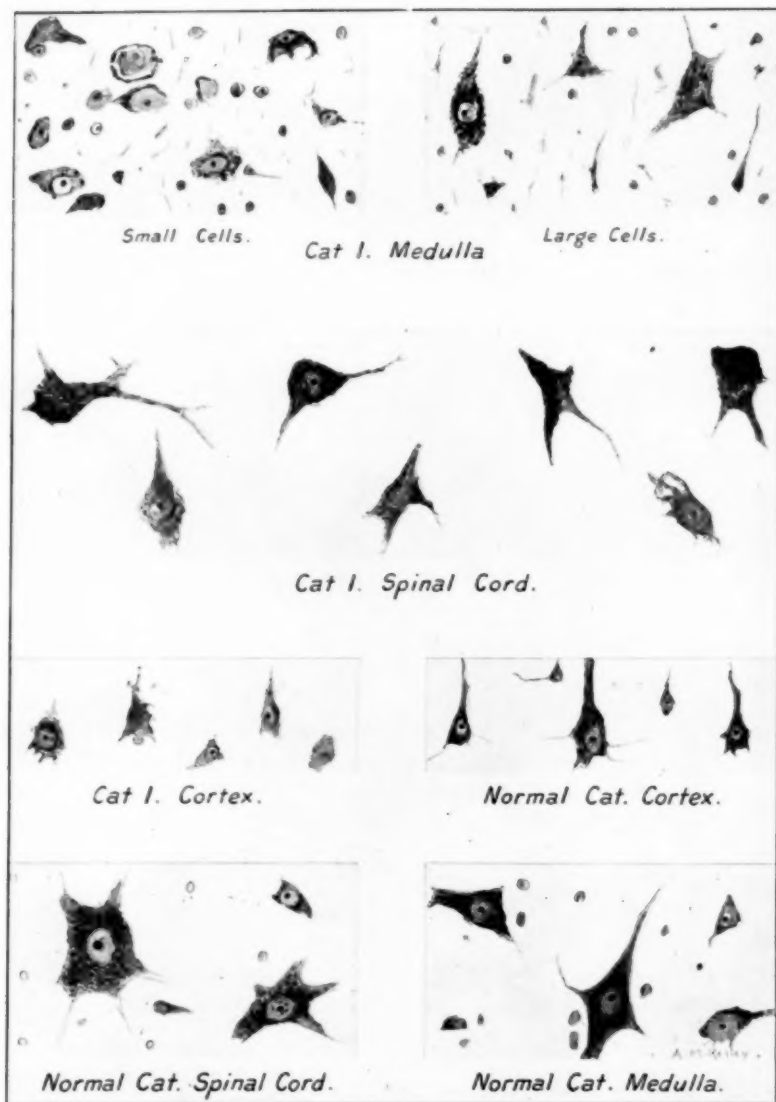


FIG. 1.

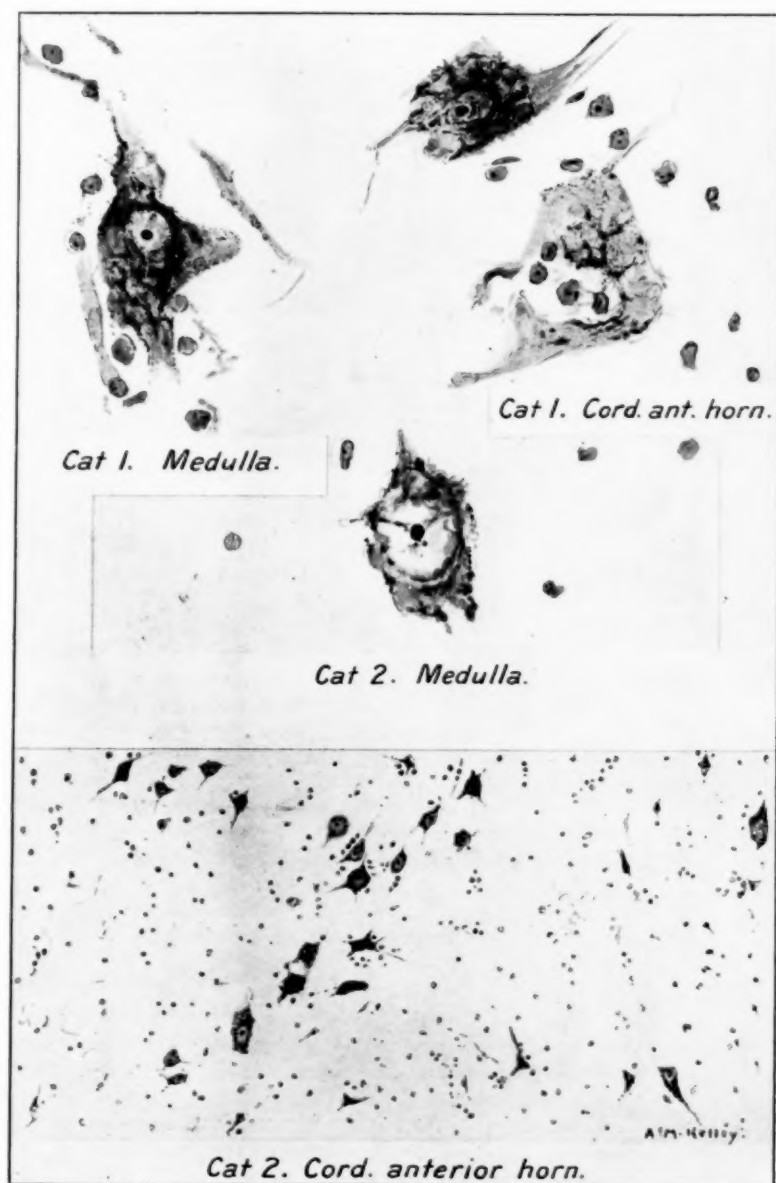


FIG. 2.

This reduction of calcium to a half in the brain of the operated dog agrees with the result obtained by MacCallum and Voegtlin: they also found a marked diminution in the amount of calcium in the blood of a parathyroidless dog. They consider that the removal of the para-

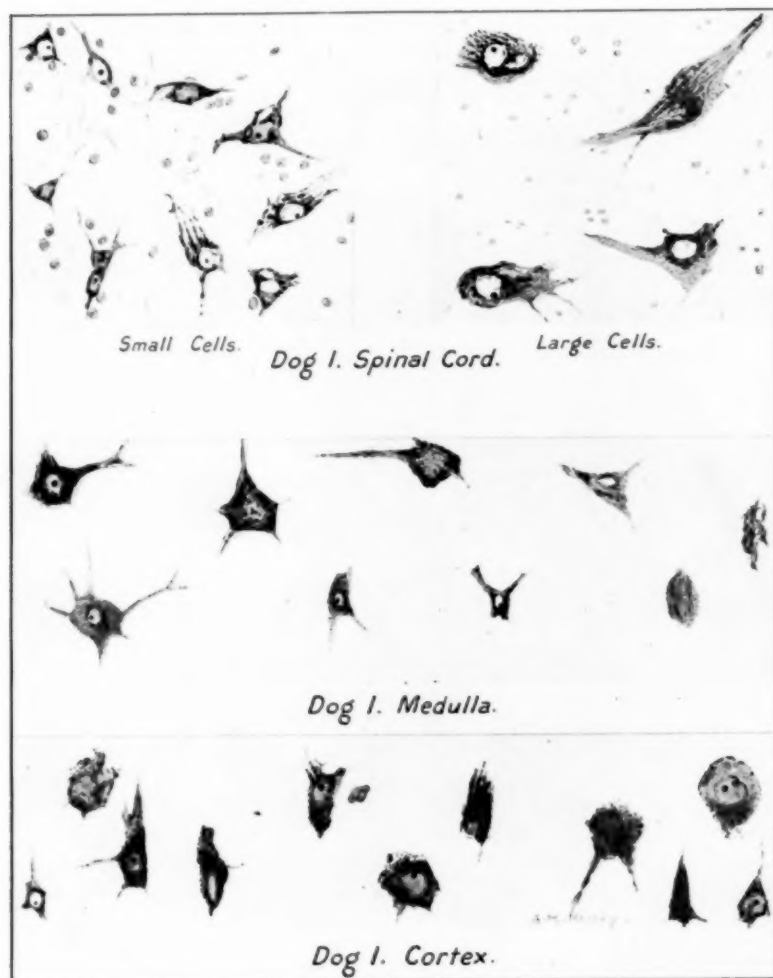


FIG. 3.

thyroids leads to a drain of calcium from the system, and that this can be remedied by the administration of calcium; the experiments here related go to confirm that view.

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- [1] EDMUNDS, WALTER. *Trans. Path. Soc.*, 1902, liii, p. 343.
- [2] *Idem.* *Journ. of Path. and Bact.*, 1912, xvi, p. 481.
- [3] MACCALLUM, W. G., and VOEGTLIN, C. *Journ. of Exper. Med.*, 1909, xi, p. 118.

DISCUSSION.

Dr. WILFRED HARRIS asked whether the cause was loss of calcium due to thyroid extirpation, or to parathyroid extirpation. Experiments had been done by feeding with parathyroid extract, and certain symptoms were supposed to be due to that.

Dr. BOX asked whether Mr. Edmunds considered that his results threw light on the curious paraplegia which sometimes occurred in Graves's disease.

The PRESIDENT (Dr. F. W. Mott, F.R.S.) asked whether Mr. Edmunds had investigated the question of the loss of calcium salts from the body by the urine in the first days following the thyroidectomy. He thought that either the animal could not use the calcium salts in its food and so the brain lost the calcium salts, or the excess of calcium salts left the body. It was desirable to know about that. He also suggested that the bones should be examined microscopically and chemically. It would be desirable also to compare the results of growth of bone in very young thyroidless animals with normal animals of the same litter.

Mr. EDMUNDS, in reply, said the symptoms were attributed to loss of parathyroid, not of thyroid. If the parathyroids only were removed one found the same symptoms in these animals. The subject had been worked at in America, where it was found that relief of the animals was brought about by the administration of calcium. He used to put his animals on calcium for a few days and then operate upon them: but when there was a delay in operating and they were kept waiting two or three months, the animals more often survived than if they were fed for only three or four days with calcium: it was necessary to continue the feeding for the whole time, for if the calcium was stopped the animals died. If the animals were fed upon milk after operation they would probably live, but if put upon meat instead of milk, they died. Many of the dogs, notwithstanding that they were put on milk, got symptoms for two or three days, but after that they passed off and life was

continued for months without symptoms if the calcium feeding was persisted in. He believed the symptoms of paralysis and weakness were due to changes in the cells of the cord, and that, he presumed, had something to do with the loss of calcium. He had not yet made experiments connected with the urine, but he thought he would be able to do so. He would expect to find excess of calcium in the urine: such had been found in America; also loss of calcium from the blood: in the blood there was only half the normal quantity of calcium.

PROCEEDINGS
OF THE
ROYAL SOCIETY OF MEDICINE

VOLUME THE FIFTH

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1911-12

OBSTETRICAL AND GYNÆCOLOGICAL SECTION



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OBSTETRICAL AND GYNÆCOLOGICAL SECTION.

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The Council think it right to state that the Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Obstetrical and Gynæcological Section.

October 5, 1911.

Dr. AMAND ROUTH, President of the Section, in the Chair.

PRESIDENTIAL ADDRESS.

The Past Work of the Obstetrical Society of London and some of the Obstetric and Gynæcological Problems still awaiting Solution.

To preside over such a Society as the Obstetrical and Gynæcological Section of the Royal Society of Medicine is the greatest honour to which one of its members may attain. I fully appreciate this honour, and am grateful to the Council for their unanimous nomination and to the members of the Section for electing me to such high office. Whilst fully realizing my own limitations, I hope to retire from the Presidency feeling that in doing my best I have, in the opinion of the Section, worthily upheld the dignity and importance of the Chair, and my task will be less difficult if the members of the Section will extend to me the kindness and the consideration which I have always experienced whilst holding other offices in the Obstetrical Society of London.

It is known to many of those present that in view of seniority, and of excellent work done for the Obstetrical Society, Dr. John Phillips would have been proposed for the post of President, but he felt reluctantly compelled to ask not to be nominated, fearing that his midwifery engagements might prevent his keeping the fixed appointments required of the President.

When nearly thirty years ago I was elected to the Fellowship of the Obstetrical Society of London the Presidential Chair was held by (the late) Dr. Matthews Duncan.

The Council in that and the succeeding years, 1882 and 1883,

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contained such honoured names as Arthur Farre, Henry Oldham, Robert Barnes, John Hall Davis, Baptiste Potter, Graily Hewitt, Braxton Hicks, William Priestley, Edward John Tilt, Spencer Wells, Charles J. Cullingworth (then of Manchester), W. S. Playfair, Henry Bennett, J. H. Aveling, Gustavus Murray, George Roper, Knowsley Thornton, and my father, C. H. F. Routh. All these obstetricians have passed away, but their works live after them, and we as their successors continue to hold them in high esteem.

Fortunately some on the 1882-83 Council still live and are equally held in our affection and estimation—John Williams, Henry Gervis, Alban Doran, Clement Godson, Edward Malins, of Birmingham, and William Stephenson, of Aberdeen; with George E. Herman and A. L. Galabin, then the Hon. Secretaries, and Francis Champneys, then Hon. Librarian. I am sure that those of that small band who are with us to-night will agree with me in saying that the members of our present Amalgamated Section are as well fitted as their predecessors to maintain the prestige and good work previously done by the older Societies.

The Obstetrical Society was founded at an inaugural meeting at the Freemasons' Tavern on December 16, 1858, nearly fifty-three years ago.

No member of the original Council and only two of the Society's original Fellows, Henry Walter Kiallmark and David Lloyd Roberts, survive.

The former, though in poor health, is still keen for all that concerns his profession, and the latter, who performed his first Cæsarean section in 1867, was able to record a successful one only three years ago (December 30, 1908)—after forty years' hard operative work. May our salutations go to these two grand veterans of Science!

I may refer to three important movements which during the last ten years have proved very advantageous to our interests.

One was the formation, on the initiative of Dr. Walter Griffith, in 1901, of a Standing Pathological Committee, to which specimens of doubtful or interesting pathology are referred by the President. The chairmanship of the Committee was held by Mr. Alban Doran till 1904, and since then by Dr. Walter Griffith, and these gentlemen, with a committee of able and keen pathologists, have done excellent work for the Section and for Science.

Another most important event in the history of the Obstetrical Society was the decision made in February, 1902, to admit ladies as Fellows. We were the first important Society to do this, and the results have abundantly justified the innovation.

The third event was the happy amalgamation of the Obstetrical Society of London and the British Gynæcological Society in 1907, and the formation of the Royal Society of Medicine, with the amalgamated societies as one of the Sections.

Since the inauguration of the Obstetrical Society in 1858 it has been concerned with the advance of obstetric and gynæcological medicine in two main directions: (1) by exercising a socio-political influence; (2) by its more normal scientific work.

As regards its socio-political work its greatest success has been the persistent agitation which it has successfully employed in favour of improved obstetric teaching both of students and midwives, and it has thus been able as a direct result to help to lessen the terrible infantile death-rate and maternal puerperal mortality which then obtained. This has been done (1) by stimulating the teaching and examining bodies to insist upon the better education of medical students in obstetrics; (2) by constantly urging the Government of the day to educate and register midwives; (3) by actually providing for the education and examination of midwives till Government itself took the matter in hand. Many of our younger members hardly realize how great an influence the Obstetrical Society has had in the improvement in obstetric training. I propose, therefore, for a few minutes to give a short review of this part of the work of the Obstetrical Society.

DEFECTIVE OBSTETRIC TRAINING.

In 1860 (*Transactions of the Obstetrical Society of London*, ii, p. 3) Dr. Edward Rigby, the first President, stated that the Council had presented a most important memorial to the General Medical Council urging upon them the imperative importance of improving obstetric education.

At the London University students had then only to attend six labours, and attendance at lectures on midwifery was not compulsory. At the Royal College of Physicians of London there was no examination in midwifery, no obstetric expert being then on the Examining Board. At the Royal College of Surgeons of England candidates had to attend three months' lectures on midwifery, but need not have personally attended any confinements. The Obstetrical Society demanded that the standard of education and examination on midwifery should be as high as that which obtained in medicine and surgery.

The immediate result of this memorial was that in the following year the Royal College of Physicians arranged to examine and grant a

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licence in medicine and midwifery, and attendance on a course of midwifery and on clinical diseases of women was made compulsory. Another result was the institution of a new office in our educational hospitals—namely, that of “obstetric physician,” whose duties were at first entirely those of an accoucheur, surgery being practically excluded.

In 1863, the President, Dr. Tyler Smith, of St. Mary's Hospital, urged that obstetric physicians should be allowed to perform the operation of ovariectomy, till then mainly in the hands of surgeons. The struggle made by obstetric physicians to practise abdominal surgery was an uphill fight and led to much ill-feeling between them and their surgical colleagues at some hospitals, and added point to the prejudice which their appointments had in many cases created. It was indeed many years before obstetric physicians were treated with the respect they deserved. In 1879 we find the President of the Society, Dr. Playfair, deploring this, and alluding especially to the fact that in such a representative body as the General Medical Council there was no representative of obstetrics.

One of the most forcible inaugural addresses was given by Matthews Duncan, when our President in 1881. He alluded especially to the efforts of Dr. Playfair in England, and of Dr. Macnaughton-Jones in Ireland, and he particularly eulogized the latter, our immediate Past-President, who he said was known “for his enthusiastic advocacy of the claims of improved obstetric teaching in our medical curriculum,” and Dr. Matthews Duncan added, with, I think, a marvellous prevision, “that without an extension of the curriculum to five years, he thought such improvement was impracticable.” As the first step to progress being made he again urged that an obstetric physician should be placed on the General Medical Council, and he stated that the Council of the Obstetrical Society had again memorialized the Government on the subject.

We may congratulate ourselves that very soon after that deputation the Government (April 20, 1883) realized the necessity of acceding to our Council's request, and that the first Representative on the General Medical Council should have been so able an obstetrician and so expert an educationalist as Matthews Duncan himself. In 1901 Sir John Williams was appointed Crown representative, and on his retirement this year Sir Francis Champneys was appointed by the Crown.

As a result of obstetric experts being now on the General Medical Council and on all Examining Boards, great improvement has taken place in the teaching of clinical midwifery, especially as regards the

attendance of the medical student in lying-in wards. This course was strongly advocated by Dr. Dakin in his Presidential Address in 1905. He advised that students should do their clinical midwifery at a lying-in hospital, and be taught there by a recognized and expert teacher who should devote all his time to the work, as is now done in Germany, where two half-year courses are required of the student, and the student has personally to deliver four women in the presence of the teacher or his assistant.

Dr. Dakin's address was given at the psychological moment, for it more or less voiced the opinion of everyone concerned, and the teaching of practical midwifery has now been put on a sounder basis. When all the teaching hospitals can either have their own lying-in wards with efficient resident teachers, or can utilize adjacent adequately staffed lying-in hospitals, all students will get efficient training. The advantage, however, to the student, in view of his future practice, of attending out-door maternity cases after he has acquired the knowledge of aseptic midwifery in lying-in wards, is also obvious, and should not be allowed to be entirely superseded.

INFANTILE MORTALITY.

In 1869 the Obstetrical Society created a standing Committee on "infant mortality," which investigated the subject, and the results were issued in a Report in 1870.

The subject of "children's diseases" was then part of the regular work of the Society, and one of England's greatest experts in that speciality, Dr. Charles West, was actually the President in 1877. Since then the subject of "children's diseases" has wisely been given over to other Sections of the Royal Society of Medicine, but our Section should still consider itself bound to do what it can to lessen the number of abortions and stillbirths, and to reduce the mortality of the new-born child, at all events so long as the infant is under our care as accoucheurs.

Much has been done by Sir Francis Champneys and others to save the lives of children born asphyxiated, and Dr. Herbert Spencer has demonstrated that many stillborn or newly born children die from cerebral and other hæmorrhages. Papers, too, have been read on gynæcological troubles in young children—by Dr. Drummond Robinson on "Vulvar Discharges in Infants"; by Mr. Stephenson, on "Ophthalmia Neonatorum"; and on "Grape-like Sarcoma" by Dr. Curtis and Dr. Williamson. We have, however, mainly concerned ourselves with

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fœtal monstrosities, hermaphroditism, and other developmental abnormalities rather than with the causes, pathology and treatment of the child in its ante-natal and new-born stages. We know very little more of the causes of intra-uterine death of the fœtus than we did when Sir W. Priestley, a Past-President of the Obstetrical Society, read his Lumleian Lectures on that subject in 1887 at the Royal College of Physicians.

Mortality both *in utero* and soon after birth is still far larger than it should be. Dr. Priestley calculated that in 1887 in London alone 9,000 *abortions* occurred annually, due to preventible causes. There is no reason to think that abortions are now less numerous or relatively less preventible than they were. The number of *stillbirths* could then only be guessed at, but we can now, thanks to the Registrar-General's statistics, estimate their frequency with fair accuracy. In 1910, 2,312 stillbirths were notified in London, representing 2·2 per cent. of the total births. If this proportion holds good for the whole of England and Wales, the stillbirths in 1910 were 19,736. Our knowledge of practical midwifery tells us that many of these stillbirths occur during delivery and are preventible.

At that date, 1887, the infantile death-rate in England and Wales during the first year of life was 145 per 1,000 births. In 1909, the rate had been reduced to 109, and in 1910 to 106 per 1,000 births, a saving of 39 infants per 1,000 births. As there were 914,372 births in England and Wales in 1909 this reduction in the infantile death-rate means a saving of the lives of 33,922 children in that year, as compared with the children who would have survived their first year if the rate of mortality had been the same as in 1887. (See Diagram A.)

The infantile death-rate is still, however, enormous, for in 1909, in England and Wales, out of 518,003 deaths 99,430, or 19 per cent., were those of infants under 1 year of age.

In London, the infantile death-rate per 1,000 births was 158 in 1887 and 108 in 1909, a saving of 50 lives in 1,000 births, representing a saving of 5,959 infant lives in the Metropolis out of the 118,078 births. In 1910 the infantile death-rate in London was only 103 per 1,000 births.

In order to emphasize the special import of this mortality to our Section I append a Table in which it is shown by the Registrar-General that out of 99,430 infants who died during their first year in England and Wales in 1909, 24,686 infants, about one-fourth, died during the first three months of life *from causes connected with birth*.

TABLE I.—INFANTILE DEATHS IN ENGLAND AND WALES IN 1909 DURING THE FIRST THREE MONTHS OF LIFE FROM CAUSES CONNECTED WITH BIRTH.

	Males	Females	Total
Premature births ...	10,108	7,899	18,007
Congenital hydrocephalus ...	41	31	72
Other congenital defects ...	2,072	1,661	3,733
Injury at birth ...	564	390	954
Atelectasis ...	874	631	1,505
Want of breast milk ...	248	167	415
	13,907	10,779	24,686

Another cause, connected with birth, of both infantile death and local inflammatory processes in new-born infants is "obstetrical infection" at birth. Such infection must be distinguished from congenital infection of the infant, conveyed through the mother, such as syphilis, small-pox, measles, malaria, &c.

"Obstetrical infection" of the infant due, for instance, to the liquor amnii being infected before birth, in some cases even when the amniotic sac is intact, is as definite an infection as the ophthalmia of vaginal gonococcal origin. It is not yet well recognized in this country that such infection may be the cause of serious sepsis of the mouth or nose, which by penetration into the lungs or alimentary canal may cause bronchitis or broncho-pneumonia, vomiting, gastro-intestinal disturbances, jaundice, &c.

The following table (Table II), taken from the statistics of the Registrar-General for 1909, shows that out of 109 children per 1,000 births who die in their first year *from all causes*, eleven die in the first twenty-four hours of life, thirty children die in the first fortnight, and about forty in the first month.

The accoucheur is responsible for the new-born child during, at all events, *the first fortnight of life*, and in that period *nearly one-third of those children who do not survive their first year lose their lives*.

TABLE II.—INFANTILE DEATHS TO 1,000 BIRTHS AT DIFFERENT AGES FROM ALL CAUSES IN 1909 IN ENGLAND AND WALES.

Die during the first twenty-four hours ...	11.5 per 1,000
Die during the next six days ...	13.1 "
Die during the second week ...	5.7 "
Die during the first fortnight ...	30.3 "
Die during first month ...	39.75 "
Die during the first year of life ...	108.73 "

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Can we not, as the Obstetrical Section of this great Society, do something more to lessen this infant mortality by encouraging the education of women in the rational management of themselves and their children during the puerperium. What more natural than that the Royal Society of Medicine, the leading Medical Society of our land, through its Obstetrical Section, associated, perhaps, with the Section for Diseases of Children, should draw up a simple set of rules for the guidance of mothers and nurses, so that the work of all the various agencies now engaged in instructing women in infantile hygiene may be facilitated by a small authoritative handbook, which could be used by all agencies. All that would have to be done would be a revision of the excellent Rules for the "General Management of Infants" drawn up by the Council of the Obstetrical Society in 1873, after the Report of the Standing Committee on "Infantile Mortality."¹ The Rules proved useful then when they were the outcome of the Society's almost isolated effort. Now such authoritative rules would be widely welcomed, for the whole country is striving to save the lives of its infants—now alas! born in such relatively small numbers. I propose to take the opinion of our Council upon this point.

Much is now being done both in the Metropolis and in the provinces by voluntary nursing and visiting organizations, especially in connexion with the work of the Central Midwives Board, often, indeed, with the keen approval, or even at the initiation, of the Local Supervising Authorities under the Act.

As showing what can be done by definite special effort to encourage lactation and discourage artificial feeding of infants, I may quote results in St. Pancras and Stepney. In St. Pancras, Dr. Sykes and the Municipal Health Authorities began their educational experiment in 1904 when the infantile death-rate was 151 per 1,000 births. Last year it was 107 per 1,000. In Stepney, under similar circumstances, it dropped from 138 to 109 per 1,000 births.

Unfortunately, a concrete example shows the converse of this progress. We have recently had a combination of drought and railway strikes which shows in a most graphic way how infants who are not breast-fed die wholesale if cow's milk be deteriorated by bacteria-dust, or if, owing to milk from the suburbs failing to be delivered in the large cities, infants have to be fed on other articles of diet. (See Table III.)

¹ See *Trans. Obstet. Soc. Lond.* (1870), 1871, xii, p. 398.

TABLE III.—DEATHS OF CHILDREN UNDER ONE YEAR TO 1,000 BIRTHS IN LONDON AND LIVERPOOL (1911).

LONDON				LIVERPOOL			
Week ending	Births	Deaths under 1 year of age	To 1,000 deaths	Week ending	Births	Deaths under 1 year of age	To 1,000 deaths
July 8	2,223	159	72	July 8	426	62	146
" 15	2,242	150	67	" 15	448	54	121
" 22	2,175	173	80	" 22	464	73	157
" 29	2,133	305	143	" 29	383	75	196
Aug. 5	2,295	461	201	Aug. 5	411	107	260
" 12	1,880	636	338	" 12	399	144	361
" 19	2,311	705	305	" 19	371	165	445
" 26	2,223	712	320	" 26	465	146	314
Sept. 2	2,200	622	283	Sept. 2	461	141	306
" 9	2,104	555	264	" 9	438	133	304
" 16	1,997	442	221	" 16	381	107	281

The table shows that in London, in the week ending July 15, 1911, the deaths of infants under 1 year of age was 150, or 67 per 1,000 births; in the weeks ending August 19 and August 26, when the great heat and the railway strike were in action, the infantile deaths rose to 705 and 712, or 305 and 320 per 1,000 births. In Liverpool, where the railway strike was more general and the absence of milk, or its deterioration from delay, was more universal, the infantile deaths on the same date rose from 54 to 165, and the death-rate per 1,000 births from 121 to 445. I suppose no one will dispute the fact that if these infants had been breast-fed this terrible mortality would not have occurred.

I quote one of the Rules drawn up by the Obstetrical Society, in 1873, which would be particularly useful in these days, when mothers so often avoid the duty of lactation for selfish reasons, or prolong the function, hoping to postpone another pregnancy. The rule says:—

"Nature provides breast milk as the proper food for an infant, and suckling is by far the best way of feeding it."

"Provided the mother has plenty of milk and is in good health, an infant requires and should have no other food but the breast milk until about the sixth month."

What a blessing to the newborn would ensue if advisory legislation or custom could make such a practice the rule rather than the exception. Cannot the united voice of this Section, as well as the advice of its individual members, do something to stem the tide of non-lactation which must act to the physical disadvantage of both mother and child,

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and which at the same time tends to annihilate the intimate mental, moral and social ties which should bind mother and child together at the beginning of an infant's life?

I append a table (IV) and a diagram (A) showing the steady fall in the infantile death-rate in England and Wales during the last thirty years.

TABLE IV.—ENGLAND AND WALES: DEATHS OF CHILDREN UNDER ONE YEAR TO 1,000 BIRTHS (1880-1910).

Year	Rate	Year	Rate	Year	Rate	Year	Rate
1880 ...	153	1888 ...	136	1896 ...	148	1904 ...	145
1881 ...	130	1889 ...	144	1897 ...	156	1905 ...	128
1882 ...	141	1890 ...	151	1898 ...	160	1906 ...	132
1883 ...	137	1891 ...	149	1899 ...	163	1907 ...	118
1884 ...	147	1892 ...	148	1900 ...	154	1908 ...	120
1885 ...	138	1893 ...	159	1901 ...	151	1909 ...	109
1886 ...	149	1894 ...	137	1902 ...	133	1910 ...	106
1887 ...	145	1895 ...	161	1903 ...	132		

It will be observed that the infantile death-rate between 1880 and 1900 averaged about 145 per 1,000 births, and actually got worse and worse, till it reached 163 per 1,000 in 1889. Since then it has steadily improved, and last year (1910) it was only 106 per 1,000, a saving of life as compared with 1899 of 57 infants out of every 1,000 born. This represents a saving of the lives of 52,026 infants under 1 year of age in England and Wales in 1910, as compared with those who would have died in 1899. I believe this result to be largely due to the compulsory education of midwives which the examinations by the Obstetrical Society of London first, and since 1905 by the Central Midwives Board, have necessitated, for about 21,000 midwives have been examined and passed by these two bodies, and it must be remembered that, roughly speaking, midwives are in attendance at about half the total births.

PUERPERAL FEVER.

The prevention of "Puerperal Fever" has been a burning question since the foundation of the Obstetrical Society, and in 1872 a strong Standing Committee was appointed "for the collection of observations on temperature during pregnancy, parturition, and the puerperal state." By this and various other methods the Obstetrical Society has constantly and consistently endeavoured to save the lives of parturient women, not only by its scientific work, but by endeavouring to get the importance of the science and art of midwifery recognized by medical opinion, and by Government and the country generally.

The history of midwives in England, and the part played by the Obstetrical Society of London in getting them educated, certificated, and registered, was admirably given by Sir Francis Champneys in his Inaugural Presidential Address in 1896. This address was given at a moment of some tension, when the Council of the Society and the Examiners of the Society's self-constituted Board of Examiners were being threatened by the General Medical Council, and even the word "infamous"—in, of course, the professional and technical sense—was being hinted at by some of those opposed to the scheme. What a comment can to-day be made on such a state of affairs when the nation

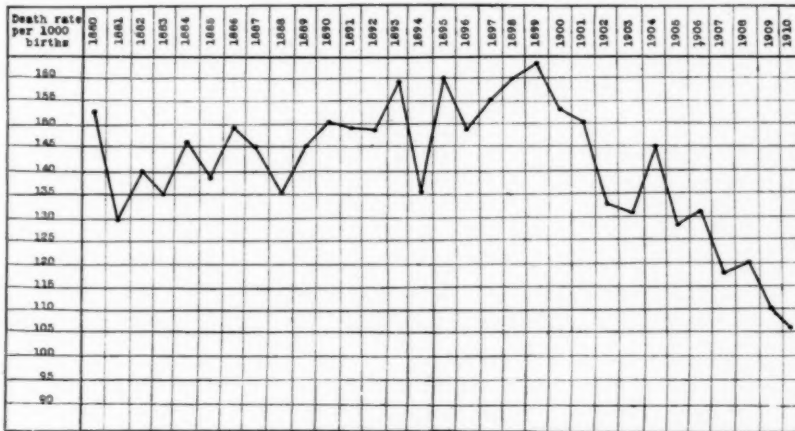


DIAGRAM A.

Deaths of infants under 1 year of age to 1,000 births in England and Wales.

has at last taken over the education and examination of midwives, and when Sir Francis Champneys, who has been the Chairman of the Central Midwives Board from its formation, is now the Crown Representative on the General Medical Council itself.

The Midwives Bill became law in 1902, and its work of examination began in 1905. The thankless work, therefore, of the fourteen years (1858 to 1872) before the Obstetrical Society was able to start its Examination Board (in 1872), together with another thirty-three years' hard work of actual examination which then followed, has been abundantly justified. Of the 10,022 midwives who had passed the Obstetrical

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Society's examinations, 7,465 elected to be put on the Roll of Midwives.

We can now see that a definite improvement has within the last few years taken place in the death-rate due to septicæmia. Undoubtedly the modern conduct of maternity cases of lying-in institutions has led not only to an enormous diminution of the mortality and morbidity due to sepsis in those institutions, but their success has shown what can be done also in general practice. In 1865-75 the British Lying-in Hospital had a death-rate of 19·4 per 1,000 births, the City of London Lying-in Hospital 14·3 per 1,000, and Queen Charlotte's Hospital 22·3 per 1,000. In the Rotunda, Dublin, the death-rate between 1811 and 1875 varied from 13·1 to 32·7 per 1,000. The mortality was, however, not always so great, for in some decades, even a hundred years ago, the death-rate in lying-in hospitals was remarkably low, from unexplained causes; thus in the British Lying-in Hospital between 1790 and 1800 the death-rate in 6,677 deliveries was only 3·2 per 1,000, and at the same date the mortality at the City of London Lying-in Hospital was only 5·7 per 1,000. Explanations of these good years in puerperal fever statistics are difficult, but the invariable rapid return of bad years prior to the routine use of antiseptics showed that when septicæmia once developed in a lying-in hospital, none of the methods then in use served to check its spread, and as a rule the lying-in hospital had for a time to be entirely closed and redecorated. As late as 1889, Dr. Galabin, in his Inaugural Address as President, when speaking of antiseptics in midwifery, said: "The hope may now be entertained that modern antiseptic methods will suffice to render healthy even a lying-in ward in a general hospital, though it is premature to speak positively on the subject until the experiment has been tried." The experiment has now been tried, and has proved completely successful, and lying-in wards in our London and provincial hospitals give us no anxiety.

The question as to how far antiseptic and aseptic midwifery has reduced puerperal mortality and morbidity in general practice is more difficult to decide.

Dr. Galabin gave the mortality of childbirth between 1847 and 1895 as 4·82 per 1,000 births and 4·45 between 1875 and 1885, more than half of these deaths being due to puerperal fever. For those who wish to study the growth of our knowledge as regards the nature of puerperal septicæmia, I would advise them to read the epoch-making discussion in the Obstetrical Society's Transactions on "The Relation of Puerperal Fever to the Infective Diseases and Pyæmia," opened by

Spencer Wells in 1875; and they should also read Dr. Watt Black's masterly résumé of our knowledge in 1891. The progress made in our knowledge in those sixteen years was enormous.

The abolishment of puerperal septicæmia is slow in arriving, much slower than was anticipated by those who witnessed under their own eyes the disappearance of sepsis in lying-in hospitals when corrosive sublimate douches were first used.

Dr. Cullingworth showed in his Inaugural Address that the death-rate of puerperal septicæmia in 1896 was not falling but actually rising. The death-rate in England and Wales from accident and septicæmia in the five years ending 1895 was 5·4 per 1,000 births, from septicæmia alone 2·5 per 1,000.

Dr. Dakin in his Inaugural Address in 1905, was able to show some improvement, the deaths in 1903 from accidents and sepsis being 4·06 per 1,000 births, those from sepsis being 1·75; but even in that year alone (1903), if all the labours had been aseptic, 1,668 women, omitting deaths due to accidents of labour, would not have been sacrificed to sepsis.

Both Dr. Cullingworth and Dr. Dakin considered that the cause of the persistent high death-rate was due partly to the ignorance of the midwives, but partly also to the fact that there were still some medical men in 1897 and in 1905 who, though well aware of the importance of antisepsis and asepsis in surgery, failed to consider asepsis seriously in midwifery practice. Since Dr. Cullingworth spoke in 1897 there have been 15,900 medical men registered in the United Kingdom, and since Dr. Dakin spoke in 1905, 5,760 medical men have been put on the Register, all of whom have been educated in strict antiseptic or aseptic midwifery; and as the total number of medical practitioners in the United Kingdom is now 40,483, many of whom have retired from practice or do not practise midwifery, it is evident that the large majority of practising accoucheurs must have been trained in modern methods.

Similar encouragement comes to us when we consider the question of trained midwives. The Secretary of the Central Midwives Board tells me that the total number of trained women put on the Roll of Midwives in 1905 was 9,787, together with 12,521 untrained women. Since then 10,412 have passed the Central Midwives Board examination, and allowing for deaths and removals, &c., it is computed that there are now on the Roll 20,065 trained and 11,614 untrained women; and each year the proportion is, of course, increasing in favour of the

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trained women. It is computed that out of the 20,000 trained women now on the Roll of Midwives only about 5,000 are practising as midwives, the rest being monthly nurses, or only obtained the certificate as a qualification for a post. On the other hand, there are probably over 10,000 untrained women still practising as midwives, and as tending to show the relative value and reliability of the two classes, it is interesting to note that only seventeen of the 5,000 trained women practising as midwives have been struck off the Register, about 3·4 per 1,000, as compared with 27·5 struck off from the 10,000 untrained midwives, or 27·5 per 1,000. In other words, the chances of being struck off the Roll for incompetency or malpractice are about eight times as great in the case of an untrained woman.

When all qualified medical practitioners and midwives practising midwifery have been trained in modern midwifery methods sepsis should be banished.

Sir Francis Champneys,¹ in a discussion at this Section last year, stated that the death-rate from "puerperal sepsis" and "accidents of childbirth" to 1,000 births was conclusive in showing recent improvement, for whereas this rate prior to 1902 was never below 4·39 per 1,000 births, it fell to 3·83 in 1907, and I am able to add the still better data for 1908 and 1909—viz., 3·57 and 3·70.

For the first time in the history of this Society its President is therefore able to testify to a very definite and steady, and I hope permanent, reduction in the death-rate for puerperal septic diseases. (See Table V and Diagrams B and C.)

In Table V and Diagrams B and C it will be seen that not only is the proportion of deaths in England and Wales from "puerperal septic diseases" becoming reduced in comparison with the deaths due to other "accidents of childbirth," but that the actual death-rate from puerperal septicæmia is steadily becoming reduced, whilst curiously and suggestively the death-rate from other "accidents of childbirth" is stationary or only slightly diminishing. Does this mean that operative midwifery, and measures taken to avert sepsis, have not tended to lessen deaths due to other "accidents of childbirth"? It is only right that we should consider this possibility, though time does not now permit me to do so, for it would not be to the credit of the profession if it succeeded in its effort to annihilate sepsis only to add to the maternal risks in other directions by anything like unnecessary interference with the natural

¹ *Proc. Roy. Soc. Med. (Obstet. Sect.)*, 1910, iv, p. 232.

TABLE V.—TABLE SHOWING IN RESPECT OF YEARS 1890 TO 1909 INCLUSIVE THE NUMBER OF DEATHS IN ENGLAND AND WALES FROM PUERPERAL SEPTIC DISEASES AND ACCIDENTS OF CHILDBIRTH, WITH THE ANNUAL DEATH-RATES PER MILLION FEMALES LIVING, AND PER THOUSAND BIRTHS.

Years	Number of births	DEATHS FROM PUERPERAL SEPSIS (see Note 1).			DEATHS FROM ACCIDENTS OF CHILDBIRTH (see Note 2).			Rate of deaths from puerperal sepsis and accidents of childbirth per thousand births (Notes 1 and 2)
		Numbers	Rate per million females living	Rate per thousand births	Numbers	Rate per million females living	Rate per thousand births	
1890	869,937	2,016	136	2·32	2,238	151	2·57	4·89
1891	914,157	2,069	138	2·26	2,718	181	2·97	5·24
1892	897,957	2,439	160	2·72	2,755	181	3·07	5·78
1893	914,572	3,094	202	3·38	2,856	184	3·12	6·51
1894	890,289	2,257	145	2·54	2,518	162	2·83	5·36
1895	922,291	1,927	123	2·09	2,292	145	2·49	4·57
1896	915,331	2,123	133	2·32	2,438	152	2·66	4·98
1897	921,683	1,898	118	2·06	2,352	147	2·55	4·61
1898	923,165	1,767	109	1·91	2,307	142	2·50	4·41
1899	928,646	1,973	120	2·12	2,353	143	2·53	4·66
1900	927,062	2,017	121	2·18	2,438	146	2·63	4·81
1901	929,807	2,079	122	2·24	2,315	136	2·49	4·73
1902	940,509	2,003	118	2·13	2,202	129	2·34	4·47
1903	948,271	1,668	97	1·76	2,189	127	2·31	4·07
1904	945,389	1,654	94	1·75	2,013	116	2·13	3·88
1905	929,293	1,734	98	1·87	2,171	123	2·34	4·20
1906	935,081	1,640	93	1·75	2,117	120	2·26	4·02
1907	918,042	1,465	81	1·60	2,055	115	2·24	3·84
1908	940,383	1,395	76	1·48	1,966	108	2·09	3·57
1909	914,472	1,429	77	1·56	1,950	106	2·13	3·70
1910	897,100	—	—	—	—	—	—	—

Note 1.—“Puerperal sepsis” includes puerperal septicaemia, puerperal septic intoxication, puerperal pyæmia, phlegmasia alba dolens, and “puerperal fever” not otherwise defined.

Note 2.—“Accidents of childbirth” includes abortion, miscarriage, puerperal mania, puerperal convulsions, placenta prævia, flooding, and “other accidents of pregnancy and childbirth.”

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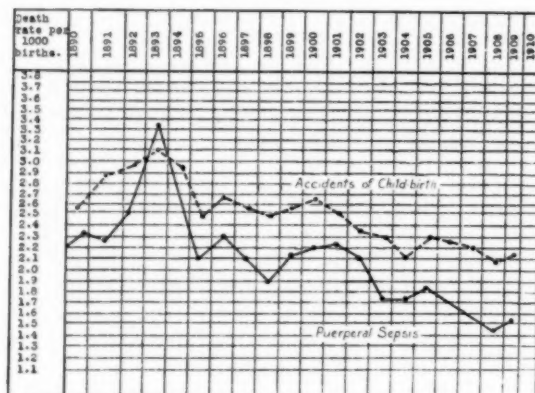


DIAGRAM B.

Death-rates from puerperal sepsis and from accidents of childbirth, respectively, in England and Wales, 1890 to 1910, per 1,000 births. The black line indicates death-rate from puerperal sepsis; dotted line, from accidents of childbirth.

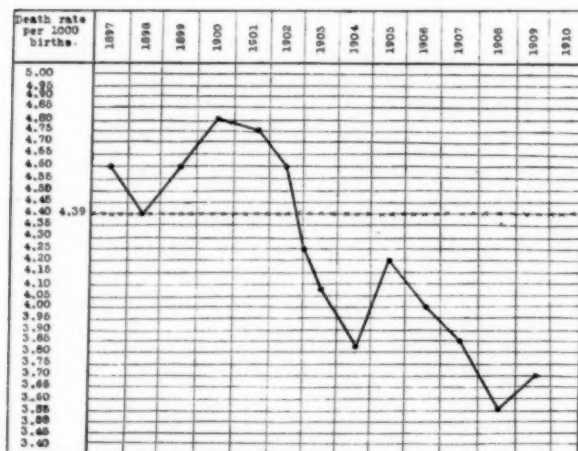


DIAGRAM C.

Death-rates in England and Wales from puerperal sepsis and accidents of childbirth, for the years 1897 to 1910 inclusive, to 1,000 births. The dotted line shows the average death-rate (4.39) for the ten years 1897-1906.

process of parturition. In London, deaths from "accidents of childbirth" show a much greater relative decline than in England and Wales. (See Table VI.)

TABLE VI.—PUERPERAL FEVER IN THE ADMINISTRATIVE COUNTY OF LONDON, SHOWING CASES OF "PUERPERAL FEVER" NOTIFIED IN LONDON, TOGETHER WITH DEATHS FROM "PUERPERAL SEPTIC DISEASE" AND FROM "ACCIDENTS OF CHILDBIRTH" BETWEEN 1900 AND 1910.

Years	Notified cases of puerperal fever	Deaths from puerperal septic disease	Deaths from accidents of childbirth
1900	—	169	230
1901	—	184	219
1902	—	200	210
1903	—	170	197
1904	—	198	159
1905	—	183	177
1906	298	187	170
1907	254	152	188
1908	228	137	182
1909	287	170	166
1910	292	152	136
1911 (six months)	145		

Note.—If the deaths from puerperal septic disease during the five years 1906-1910 had all been notified, they would represent a death-rate of 58·7 per cent. of cases notified. Table VIII shows the notifications and deaths in London during the first six months of 1911.

Members of the Section will agree with me that Table V and Diagrams B and C are, on the whole, very satisfactory evidence of success achieved.

NOTIFICATION OF CASES OF PUERPERAL SEPTICÆMIA.

Complete or reliable information as regards the number of cases of puerperal septicæmia in England and Wales has been very difficult to obtain till now, as notification has not been enforced. In future there will be no such difficulty, for a General Order was issued by the Local Government Board on December 13, 1910, requiring *every* Medical Officer of Health to send in weekly returns of notified infectious diseases, including puerperal fever. Returns are accordingly now received every week from the majority of the 1,800 sanitary districts in England and Wales.

Table VII gives the notifications of puerperal fever for England and Wales during the first six months after the General Order of last December, and shows that during that period there were 1,013 cases notified.

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TABLE VII.—NOTIFICATIONS OF PUERPERAL FEVER IN ENGLAND AND WALES,
JANUARY TO JULY, 1911.

Week ending	Number of cases	Week ending	Number of cases	Week ending	Number of cases
January 7 ...	43	March 4 ...	39	May 6 ...	47
" 14 ...	38	" 11 ...	45	" 13 ...	34
" 21 ...	41	" 18 ...	45	" 20 ...	30
" 28 ...	50	" 25 ...	40	" 27 ...	37
February 4 ...	35	April 1 ...	39	June 3 ...	24
" 11 ...	35	" 8 ...	38	" 10 ...	22
" 18 ...	52	" 15 ...	38	" 17 ...	25
" 25 ...	54	" 22 ...	39	" 24 ...	36
		" 29 ...	44	July 1 ...	43
			Total (26 weeks) ...	1,013	

Table VIII shows that the notifications for the last six months of this year (1911) in London have been 145, and the deaths notified during the same period were 68, a percentage mortality of the cases notified of 46·9, which is less than the apparent percentage mortality shown in footnote to Table VI. Probably, however, in the earlier notification years all cases were not notified.

OTHER MEDICO-POLITICAL SUGGESTIONS.

Other medico-political suggestions have been made from time to time by Presidents of the Obstetrical Society. I will only mention two.

Dr. Matthews Duncan in 1881 (vol. xxiii, p. 75) urged that women about to be married should receive legislative protection from syphilis—that, in fact, it should be criminal for a man to marry who had a recent or active syphilis. He also wished it be considered criminal for a woman who had syphilitic sores on her pudenda to fail to warn her accoucheur of the circumstance. He instanced an accoucheur who only survived eighteen months after attendance upon such a case.

Dr. Herbert Spencer in 1907 (vol. xlix, p. 129) suggested that in order to ensure cases of uterine cancer coming earlier under treatment two definite steps should be taken:—

(1) To diffuse the knowledge of the symptoms of the disease among women, as has been done with good results in Germany.

(2) To urge upon the general practitioners that it is a neglect of duty to treat hæmorrhage or discharge which may be due to uterine cancer without making or advising a local examination.

To emphasize the importance of such steps I may state that in the nine years 1901-1909, 152,737 women over 25 years of age died from cancer, and of these 35,516 died from cancer of the uterus. This

TABLE VIII.—PUERPERAL FEVER IN LONDON, JANUARY TO JULY, 1911. NUMBER OF CASES NOTIFIED AND NUMBER OF DEATHS IN EACH SUCCEEDING WEEK.

Week ended Saturday	Number of cases notified	NUMBER OF DEATHS IN THE SUCCEEDING WEEK			
		All ages	20 to 25	25 to 35	35 to 45
January 1	5	1	—	1	—
.. 7	8	5	1	1	3
.. 14	6	2	1	—	1
.. 21	4	5	2	2	1
.. 28	4	5	—	5	—
February 4	2	2	—	2	—
.. 11	6	2	—	1	1
.. 18	2	2	—	2	—
.. 25	11	3	—	2	1
March 4	7	—	—	—	—
.. 11	4	4	—	4	—
.. 18	8	2	—	1	1
.. 25	4	1	—	1	—
April 1	4	3	—	—	3
.. 8	8	1	—	1	—
.. 15	10	3	1	2	—
.. 22	6	2	—	2	—
.. 29	8	4	3	1	—
May 6	7	2	1	1	—
.. 13	4	5	2	2	1
.. 20	6	—	—	—	—
.. 27	9	5	—	2	3
June 3	3	2	—	1	1
.. 10	3	—	—	—	—
.. 17	3	4	1	1	2
.. 24	3	3	—	3	—
	145	68	12	38	18

Total for half-year :—

145 cases notified in period December 24, 1910, to June 24, 1911.

68 deaths in period January 1, 1911, to July 1, 1911.

= a death-rate of 46·9 per cent. of cases notified.

Note.—The above figures relate to notifications and deaths of puerperal fever in the Administrative County of London. The estimated population in the middle of 1911 is 4,522,628. The annual rate per 1,000 persons living of the cases notified in London is 0·06 (as compared with 0·7 in 212 provincial towns).

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represents 23·2 per cent. of the total deaths from cancer, and Dr. Eden, in his "Manual of Gynæcology," says that 96 per cent. of these are cervical cancer, 4 per cent. cancer of the body of the uterus.

On the whole I think it might be a wise thing if our Section, or the Royal Society of Medicine, had a standing Socio-political or Parliamentary Committee, which could take up various subjects and influence the Government or other bodies when opportunity offers or occasion requires.

I think I have shown that the Obstetrical Society of London, during its short career of fifty-three years, has been of use to the community by its medico-political influence. If our Section had had such a Standing Committee we might even during the last few months have pressed upon the Government better conditions for the doctor and the patient in the Maternity Clauses of the National Insurance Bill, which is still under discussion, and so have strengthened the hands of the General Medical Council, Royal College of Physicians, and other bodies working to improve the condition of parturient women of the poorer classes. I propose to take the opinion of our Council on the whole subject.

THE FUTURE OF OBSTETRICS AND GYNÆCOLOGY.

(I) *Obstetrics.*

I am becoming more and more convinced that we shall get very little further in our knowledge of the physiology of menstruation, labour and lactation, and of the causation of the toxic diseases of pregnancy and the puerperium, unless we call to our aid not only the bacteriologist but also the physiological chemist. Physiological chemistry is an extremely difficult science, and none but experts can tackle it. Those interested in the subject should read Dr. A. E. Garrod's paper on "Where Chemistry and Medicine Meet."¹ So difficult is it that it seems to me that until we have chairs and laboratories specially instituted for the study of these branches of biological chemistry in our teaching schools, we shall get very little beyond our present scanty and clouded knowledge, not only of the cyclical occurrence of the functions named, but also of the toxæmias of pregnancy and the puerperium. The question as to how this additional chemical branch of pathological research is to be provided is likely to prove difficult. Inasmuch as it is required for the correct diagnosis and efficient treatment of the patients in

¹ *Brit. Med. Journ.*, 1911, i, p. 1418.

hospital, it is not only rational, but just, that the hospital, rather than the medical school, should finance the matter, both from the point of view of salary for the expert chemist at the head of the department and of money required for its equipment and upkeep.

Menstruation.—At the very beginning of our study of obstetrics and gynæcology the subject of menstruation has necessarily to be considered. We know very little either of the causation or of the significance or utility of menstruation. Heape¹ has proved that the pro-œstrum stage of the "rut" in animals is homologous with menstruation, and that ovulation is not the controlling factor, and as a result the nerve and ovulation theories as to its cause are now largely surrendered in favour of the theory that its cyclical occurrence is due to a recurring biochemical change in the blood. One of the elements in this change appears to be an excess of the salts of calcium, a fact put forward in our Section by Dr. Blair Bell,² who considers that the uterus of woman is homologous with the calcium chamber of birds, and that the calcium metabolism is largely influenced by the internal secretion of the ovary and of the other ductless glands.³ Thus enlargement of the thyroid gland, as in Graves's disease and cretinism, tends to amenorrhœa or diminished menstrual loss; atrophy of the thyroid gland, as in myx-œdema, tends to increased menstrual loss; and growths of the pituitary gland, as in acromegaly, tend to amenorrhœa. The whole subject is still obscure, and awaits the solution at the hands of physiological chemists.

Labour and Lactation.—Both labour and lactation can occur without spinal nerve influence, as I showed in a case of traumatic paraplegia.⁴

What is the chemical substance which is thrown into the bloodstream by uterine or placental metabolism at, or soon after parturition, and which causes⁵ the mammary glands to secrete milk and the liver to secrete glucose to supply that milk with sugar? Is this chemical substance identical with that which starts the onset of labour.

Lutein Tissue.—What, for instance, is the influence exerted by lutein tissue? Dr. Cuthbert Lockyer⁵ has done much to answer this question in our own Society's Transactions, from the clinical and pathological standpoint. What is its action upon the health of the individual? What is the influence which its excess or diminution has

¹ "The Sexual Season of Animals, &c.," *Quart. Journ. Micros. Sci.*, 1900-1, xlv, pp. 1-70.

² *Proc. Roy. Soc. Med. (Obstet. Sect.)*, 1908, i, p. 291.

³ Goodall and Conn, *Surg., Gynæcol. and Obstet.*, Chicago, 1911, xii, p. 457.

⁴ *Trans. Obst. Soc. Lond.* (1897), 1898, xxxix, p. 191.

⁵ *Trans. Obstet. Soc. Lond.* (1905), 1906, xlvii, p. 157.

upon the dates and occurrences of such functions as menstruation, ovulation, fertilization, and implantation of the ovum,¹ labour and lactation? Does it influence the onset of the menopause? Is lutein tissue one of the essential bio-chemical products, one, at all events, of the ovarian internal secretions, which by getting into the blood exerts a controlling or exciting functional influence until recently unsuspected?

Auto-toxæmia.—We know nothing of the chemical constitution of the toxins producing hyperemesis gravidarum, albuminuria, eclampsia, the chorea of pregnancy, acute yellow atrophy of the liver, and puerperal insanity. Are these toxins produced from the ovarian or the placental metabolism? What can be the explanation that injection of a solution of iodide of potassium into the mammary glands, or amputation of both breasts as performed by Sellheim, can cure eclampsia?² It seems a brutal operation, yet is it possible that there is a theoretical justification for it, and that the internal secretion of the mammary glands is liable to change and become toxic and cause eclampsia.

With reference to this possibility, Dr. Herbert Spencer has drawn my attention to a puerperal disease in cows attended with coma, successfully treated by mammary injections, of which he had been informed by his brother, Mr. Trevor Spencer, M.R.C.V.S., of Kettering, to whom I am indebted for the following note:—

With regard to the udder treatment for "drop," or "parturient apoplexy" as we call it, not very much is known of the pathology of the disease, but it is apparently due to a toxin formed in the udder at the time of calving, especially in deep milkers, and occurs most often at the third or subsequent calving; it is never seen at the first birth and very rarely at the second.

Shortly after calving, from a few hours to three days, the cow begins to "paddle" with the hind feet, and has a wild, excited countenance; the animal then staggers, and in attempting to move falls headlong. Paralysis and coma soon appear, the breathing becomes stertorous, the animal assumes a characteristic attitude by turning her nose to her flank, and occasionally throws her head about violently in delirium; the symptoms being all those of intense brain congestion.

Some years ago, before the udder treatment was adopted, the disease in most localities was regarded as quite incurable, and in some parts slaughter-houses were erected by the neighbouring farmers, and to these the affected cows were conveyed and slaughtered for food without any treatment being undertaken. At this time I met with a good deal of success by the use of

¹ See p. 26, under "Hydatidiform Degeneration of the Chorion."

² *Brit. Med. Journ.*, 1911, i, p. 1444.

large repeated doses of chloral hydrates and bromide of potassium. I used to give from 8 dr. to 12 dr. of each of these drugs every three hours for six or eight doses. About 35 to 40 per cent. recovered with this treatment.

I then began the udder treatment, as suggested by Schmidt, of injecting a solution of iodide of potassium into the breast with air injection afterwards. This sometimes led to mastitis, so that I now inject into each quarter of the udder half a pint of a warm solution of chinosol of the strength of 30 gr. to a quart; the udder is then massaged for a few minutes, and then blown up tightly with oxygen and again massaged, the gas and solution being left in for some hours. The cow is on her feet and perfectly well in from four to twelve hours, and no other treatment of any kind is required; 98 per cent. recovering from the disease. There is no special virtue in the chinosol, or in the oxygen either, any mild antiseptic and air pumped in acts equally well. I use oxygen rather than air because one is not so likely to get septic trouble afterwards. I have found that when I used only the oxygen the cow got up just as quickly as when an antiseptic was also used, but a relapse often occurred and the treatment had to be repeated. I have seen about 1,000 cases of this disease, which is not nearly so common now as formerly, and of these cases only about three or four occurred during pregnancy. It is unaccompanied with pyrexia or with convulsions. Cows thus affected not infrequently have similar attacks in subsequent confinements.

Puerperal Fever.—We know absolutely nothing of any reliable specific means of treating puerperal fever, although we are supposed to know the various specific germs which produce it. Yet how is it that polyvalent serum prepared from streptococci obtained from many cases of puerperal septicæmia is so very seldom successful, and indeed serum therapy seems only really successful, even when a streptococcal infection seems certain, in cases where pus has already formed in the pelvic cellular or perimetrial tissue and to some extent, therefore, localized the infection. As I suggested in my Cæsarean Section monograph,¹ can no way be found by which the infecting germ can be discovered at the onset of infection by differential staining, &c., without waiting for a culture diagnosis? Can no more rapid way than is now possible be then found by which a serum can be made from the patient's own brand of streptococcus or other germ thus found, and so save her life? Or is there some other fact of which we are now ignorant to explain our failure to cure these septic cases by a specific antitoxin?

One such fact may be that though streptococci, &c., are usually found in the genital discharges in cases of acute puerperal septicæmia,

¹ *Journ. of Obstet. and Gyn. of Brit. Emp.*, 1911, xix, pp. 1 and 236; and *Proc. Roy. Soc. Med. (Obstet. Sect.)*, 1911, iv, p. 197.

they are much more rarely found in the patient's blood, even five or six days after infection. This points to severe general toxæmia of local origin, rather than to a true general infection, and may explain the failure of serum therapy. I believe that most cases of puerperal septicæmia are for some days only cases of local infection of uterus and its veins and lymphatics. For this reason I personally rely with much greater confidence upon early exploration and clearing out of the uterus and swabbing with strong iodine solution, and giving large doses of liquor ferri perchlor. to increase the general resistance, rather than upon any attempt to combat the infection itself. Vaccine therapy has also been advocated, but no definite results have followed its use in acute puerperal sepsis, though success has apparently followed its use in subacute or chronic cases.

The failure of bacteriological treatment in puerperal septicæmia¹ is all the more disappointing when we see how similar treatment answers for allied conditions. For instance, we know the good results of vaccine therapy in cases of chronic gonorrhœal cystitis, endometritis, and salpingitis; and I have seen two cases where vaccine prepared from the patient's own gonococci was used during subsequent attacks of acute salpingitis, the attack in each case subsiding at once, contrary to the opinion generally held.

After careful work, Dr. Lea, of Manchester, read a paper at this Section,² and is of opinion that organisms indistinguishable from pyogenic streptococci, together with diplococci and *Bacterium coli*, are not infrequently present in the vagina of pregnant women.

The fact is, however, that we are not yet quite sure of the significance of the germs thus found in the vagina at the onset of labour, whether we believe in Döderlein's theory or not. If we were really sure that the streptococci, staphylococci, *Bacillus coli*, &c., present in the vagina of a healthy woman during labour were liable to infect her, it would be our duty to disinfect and sterilize the vagina in every case before labour, precisely as we do before vaginal operations. Experience appears to show that this is not necessary, and it seems more than probable that the patient is immune from the germs which are habitually present in her own vagina—immune in this case apparently by means of Döderlein's bacillus—and that she only becomes infected when germs are introduced from without, germs for which

¹ See *Lancet*, 1911, ii, p. 531.

² *Proc. Roy. Soc. Med.*, 1909 (Obstet. Sect.), ii, p. 129.

there is not in her own system an antibody to resist. A man bitten by the teeth of a cat or dog may get a fatal sepsis, yet that cat or dog can freely and advantageously lick its own wounds.

It is known that the serum obtained from a pregnant woman has different qualities from that of other women, but very little is known of the actual and essential differences, except as regards the effect upon animals of inoculations of the serum. Physiological chemists have not yet discovered the chemical constitution or molecular structure of the substances concerned. It is said to be possible to diagnose the existence of pregnancy by a serum test founded upon the power of the serum to hinder the action of the proteolytic ferments such as trypsin.¹

It is further shown by Krause and Graff,² of Vienna, that during the first eight months of pregnancy placental serum has a remarkable power of destroying cancer cells, and of resisting cancer invasion by manufacturing an anti-cancerous substance. Is this a partial explanation of the rarity of the combination of cancer and pregnancy, and perhaps a partial explanation of the improvement which pregnancy usually exerts upon the spread of tuberculosis, and the almost inevitable downward progress due to the disease after labour. In this connexion I may allude to the fact that the presence of pregnancy prevents perfect reliance being placed upon blood tests in some cases. Thus, according to Stern,³ local tuberculin reactions are distinctly diminished during pregnancy. In healthy non-pregnant women 65 per cent. gave positive reaction to the cutaneous and 14·5 per cent. to the conjunctival tuberculin test, whereas in the seventh, eighth, and ninth months of pregnancy the cutaneous reaction diminished to 36, 30 and 28 per cent. respectively, and the conjunctival reaction results were consistently negative.

There is reason to believe that pregnant women⁴ have some sort of immunity from scarlatina, and puerperal women a special liability to it. Olshausen⁵ could only find instances of 7 cases of scarlatina during pregnancy, as compared with 134 within one week after delivery. Boxall,⁶ in a paper read before this Section, did not think

¹ *Lancet*, 1911, i, p. 1526.

² *Med. Press and Circ.*, 1911, cxliiii, p. 166.

³ *Zeitschr. f. Geb. u. Gyn.*, Stuttg., 1910, lxvi, pp. 532-50.

⁴ G. F. Blacker, M.D., "Practice of Midwifery," 1910, p. 1001.

⁵ "Puerperal Scarlatina," *Archiv f. Gyn.*, Berl., 1876, x, pp. 169-195, and *Obstet. Journ.*, iv.

⁶ *Trans. Obstet. Soc. Lond.* (1888), 1889, xxx, pp. 11 and 126.

that this was due to a delayed period of incubation in pregnant women.

Good work has been done in this Section on the physiological action of the placenta by Dr. Dixon and Dr. Frank Taylor,¹ but very much more remains to be done.

I wish to allude now to a few instances showing our ignorance as regards the origin of common diseases, for it is mainly the ætiology of obstetric diseases which is now puzzling us.

Hydatidiform Degeneration of the Chorion.—What, for instance, is the cause of cystic degeneration of chorionic villi? We believe it is of foetal rather than maternal etiology, but mainly because it may occur in one of twins, the other placenta being normal. What else do we know about its causation? The frequent association of lutein cysts with this condition, and the established fact that destruction of the corpus luteum in rabbits prevents implantation of the ovum by preventing the development of the trophoblast, have led to the belief that this associated excess of lutein tissue may be the cause. Perhaps, as Dr. Blacker suggests, there may be a common cause both of the proliferation of the chorionic epithelium and of the lutein cells. What explanation, again, have we of the development of chorionepithelioma?² Is there a benign and a malignant hydatidiform degeneration of the chorion? Can they be differentiated? What is there in chorionepithelioma different to other malignant growths which in some cases enables a timely hysterectomy to cure the patient even when metastatic growths have developed in the lungs? Or is there a benign and a malignant chorionepithelioma, as has been suggested?

Ectopic Gestation.—Are we any more sure of the causes of tubal gestation than we were before Lawson Tait suggested a previous chronic salpingitis?

Phlegmasia Alba Dolens.—What, again, is the pathology of true phlegmasia dolens (the lymphangitis type)? Is it due to an infection or a secondary toxæmia? Its sudden, fairly punctual onset, its course and duration, seem to point to a specific microbic origin.

Pyelo-nephritis of Pregnancy.—What is the true explanation of the pyelitis of pregnancy known to be due to *Bacillus coli* infection, and why is the right kidney almost always primarily attacked? Explanations are plentiful, fanciful, and often mutually destructive.

¹ *Proc. Roy. Soc. Med. (Obstet. Sect.)*, 1908, i, p. 11.

² See Frank, *Amer. Journ. of Obstet.*, New York, 1911, lxiv, p. 435.

(II) Gynæcology.

Inflamed Appendages.—Turning now to gynæcology, I would like an authoritative paper from one of our seniors as to when a pyosalpinx, or a matted tube and ovary the result of salpingitis, should be operated upon, and when left alone or otherwise treated. Personally, I believe that such cases should very rarely be dealt with by abdominal section, and practically never during the acute stage when the pus in the tubes is virulently infective.

Fibrosis of Uterus.—What do we know of the pathology of so-called fibrosis of the uterus? There is no doubt it exists, though till lately it was unsuspected. The best account of fibrosis which I have read is in Dr. Eden's "Manual of Gynæcology"; but are the microscopical changes described by him infective, inflammatory, or degenerative? In such cases, with our present knowledge, hæmorrhage becomes almost intractable. Can nothing but hysterectomy stop the bleeding? What would be the effect of exposure to X-rays?

Menorrhagia of Puberty.—What is the explanation of the menorrhagia of puberty which is sometimes so severe and intractable as to bring young girls almost to death's door. Is it a uterine or a constitutional disease? There is no direct evidence that it is due to a blood abnormality, yet the best remedy, in my experience, is prolonged treatment with lactate of calcium.

"Fungous Endometritis."—I would like this Section, or the Obstetric Section of the International Medical Congress meeting in 1913, to decide that the word "endometritis" should cease to be used for adenomatous overgrowths of the uterine mucosa. Everyone agrees that it is an obsolete and erroneous expression, yet its use is continued, often with the prefix "so-called," or it is put in inverted commas to show its erroneous ambiguity. The main difficulty is to find a word which will cover all the benign varieties of adenomatous overgrowth which would be included, just as the word "adenoids" covers different types of adenomatous growth in the nasopharynx of children. In this connexion I may mention that I have very frequently found that women from whose uteri I have scraped unusual quantities of adenomatous tissue suffered from adenoids as children.

Vascular Caruncle.—What is the cause of vascular caruncle of the urethra? And why is it so prone to recur? How is it that no nerve-tissue has been demonstrated in their structure, when they are such painful growths?

Fibromyomata.—Dr. Clay, of Manchester,¹ a Fellow of the Obstetrical Society of London, read at one of its meetings in 1863 an account of two abdominal hysterectomies for fibroids with intraperitoneal treatment of the stump done in 1844 and 1863, the first performed in this country, one case recovering. A study of the Transactions of our amalgamated societies shows the steady progress which has been made, until at the present time mortality after hysterectomy for fibroids is almost non-existent, unless the operation has been too long delayed, or unless constitutional or local complications are present. I am, however, entirely opposed to the view that a fibroid which is producing no symptoms should be removed for fear of symptoms or degenerations which may or may not subsequently develop. That is not conservative surgery, and unless the patient is going to the Tropics, where fibroids always get larger, and where menorrhagia is sure to occur, or unless other special circumstances are present, I do not operate till symptoms arise. I have, on at least two occasions, postponed surgical interference on patients who subsequently became pregnant and were delivered of healthy children. We are still ignorant of the causation of fibromyomata.

In his Inaugural Address in 1887, Dr. John Williams,² as he then was, suggested that just as antiseptics in midwifery had given obstetricians the power to prevent chronic disease and suffering in women, so perhaps in forty years' time some President of the Obstetrical Society would be able to announce that a means of preventing the growth of ovarian cysts, uterine fibromyomata, and even cancer had been found. Twenty-four years have since elapsed. Do we as yet know anything more of the causation of these diseases?

All observers seem to think that the starting point of a fibroid is in or around a small capillary.

Lawson Tait,³ in 1882, believed that the deranged production of muscle-cells which began by a growth near to a vascular supply was due to some error of the nerve influence which he believed to govern menstruation.

Dr. Elizabeth Willey⁴ drew attention in a valuable paper at this Section in 1909 to the views of Klebs, Pilliet, and others, who believed that fibroids begin in the uterine capillaries themselves. Mrs. Willey

¹ *Trans. Obstet. Soc. Lond.*, (1863), 1864, v, p. 58.

² *Trans. Obstet. Soc. Lond.*, (1887), 1888, xxix, p. 107.

³ *Trans. Obstet. Soc. Lond.*, (1883), 1884, xxv, p. 200.

⁴ *Proc. Roy. Soc. Med.*, 1909, ii, p. 164.

considers that fibroids originate in proliferating uterine muscle-cells, developed in vascular tissue; and that the stimulus producing the proliferation has some relation to the activity of the sexual organs. Even, however, if Mrs. Willey's views are right, we need to discover the remote cause which, acting probably through the blood supply, stirs these muscle-cells, grouped round the smaller vessels, into activity.

The effect of oöphorectomy and the action of X-rays point to the exciting influence being an ovarian (Graafian follicle) internal secretion. Can lutein tissue here, again, be the starting point in the development of fibroids?

Cancer of the Uterus.—Is anything known of the cause of uterine cancer? Do we realize that in the last nine years over 34,000 women in England and Wales have died of cancer of the cervix uteri (*see pp. 18, 19*). This is at the rate of 3,777 deaths a year. Since Sir John Williams's Harveian Lectures in 1886 but little has been done to try and find the clinical precursors to cancer of the cervix. He proved that there was no causal relation between cervical laceration and cancer, and considered that there was then no available scientific evidence that glandular erosions predisposed to malignant change. Those who have had patients develop cancer of the cervix, whose previous clinical history is known as regards changes in the cervix uteri, might easily help us to obtain evidence on the subject.

Sir John Williams¹ quoted the views of Ruge and Veit, who had described cases of glandular cancer originating in erosions, and also described cases of his own where cancer had developed from the deeper glands underlying an erosion, but he had always found healthy gland tissue between the new growth and the papillary glands of the erosion. He had seen no case where the surface glands of an erosion became primarily cancerous, though one of his cases (Case XXVII, p. 69) is not at all conclusive on the subject.

"Cervical Erosion."—Our views as to the significance of cervical erosion will depend upon the views we hold regarding the relationships between erosion and cancer. Some of us may recall Dr. Robert Lee's sarcastic description of Dr. Henry Bennet's "ulceration of the cervix uteri," which we now inadequately call "an erosion." Lee said, "the so-called ulceration could not be recognized by the sense of touch, for it had no margin, inverted or everted; it could not be seen through the speculum till the part had been rubbed with nitrate of silver; it had

¹ "Cancer of the Uterus," Harveian Lectures, 1886, pp. 36-40, 69.

neither centre nor circumference, beginning nor end." Although Dr. Bennet's pathology, nomenclature, and his overdrawn accounts of the condition were alike wrong, he was the first, as Dr. Watt Black told us in one of his Presidential Addresses, to discover that pelvic inflammation existed in the non-puerperal state. Has not the pendulum of reaction, due in this case to the exaggerations of the discoverer and the ridicule of his critics, swung too far? Are we correct in our present view that we may safely ignore the existence of an erosion? Have we no evidence that it may predispose at a later date to a less benign proliferation of the glands and of their lining of columnar cells, and be, in fact, an early evidence or indication of a tendency towards epithelioma. Prolonged ineffective treatment of an erosion causes great inconvenience to the patient, and, as Dr. Herman has emphasized, adds distinctly to her nervous tension. What, then, should be our attitude in dealing with cervical erosions? I notice that many advise that erosions should be treated drastically, for instance by scraping deeply and using the actual cautery. Is this because they have a misgiving that they predispose to epithelioma? I have no real evidence one way or another, and personally do not feel able to dogmatize on the subject.

Dysmenorrhœa.—There is no recognized consensus of opinion on this subject, indeed, I think views as to dysmenorrhœa are less definite now than they were two or three years ago. What examiner in gynæcology would venture to set a question to-day on the "Varieties and Causation of Dysmenorrhœa?" The elementary question, "What is Dysmenorrhœa?" or even, "Whether Dysmenorrhœa is a Symptom or a Disease?" would meet with curiously divergent answers, according to the medical school of the student. Do we yet know how to explain intermenstrual dysmenorrhœa or *Mittelschmerz*?

Ovarian Papillomata.—What is the explanation of the occasional complete disappearance, after an apparently useless laparotomy, of large masses of ovarian papillomata which have extensively involved both the peritoneal and subperitoneal tissues, the patient recovering perfectly with nothing but a fibrous body to show where the ovary originally was, as I was able to prove in one case.¹ In the large majority of such inoperable cases death rapidly supervenes, yet the papillomatous growth is microscopically identical with the cases that recover. In other words, how can we tell when such papillomata are malignant or benign?

The Future of Gynæcology.—What is to be the future of Gynæcology? Is it to continue to become more and more surgical? I think not. Is

¹ Routh, Amand, *Trans. Obstet. Soc. Lond.*, (1907), 1908, xlix, p. 216.

it not more than possible that in the not distant future some President of the Section will give an Inaugural Address upon "Treatment other than Operative, in Gynæcology," and will base his remarks upon the wonderful discoveries being made in bacteriological, chemical, electrical, and radiographical therapeutics. Even as it is, without considering these new aids in treatment, is there not a tendency nowadays to consider ourselves surgeons only rather than a happy combination of physician and surgeon; to advise an operation because it is the easiest way to treat the case; or to operate in the rush of both hospital and private practice without previous constitutional preparation of the patient.

Wertheim's Operation.—Are we not also prone to go to extremes in the details of some of our newest methods of operating. I doubt much if Wertheim's operation for the very advanced cases of cancer of the cervix uteri will continue to be considered wise, nor do I think it will continue to be adopted for very early cases, but rather be reserved for those middle cases where the extended operation is likely to be permanently successful and worth the extra immediate risk, or where in an early case it is doubtful whether a vaginal operation would suffice to remove all affected tissues.

Ventrifixation.—When one hears of the large numbers of cases of ventrifixation being done both in hospital and private, and the numerical proportion they bear to other abdominal operations, one ventures to wonder whether those who thus so frequently treat prolapse and retroversion have had any real experience of the advantages, during the child-bearing age, of vaginal pessaries, wisely selected and skilfully applied. I have not come across cases requiring ventrifixation in anything like the proportion that some others have, and I do not know how to explain the difference.

Mortality Statistics.—Why is it that statistics of large series of abdominal operations are not improving during the last few years? Zweifel says that the death-rate from all causes after operation has risen from 5.5 per cent. in the period 1887-92, to 7.8 per cent. in the period 1903-09. No doubt this is due partly to the introduction of such heroic operations as Wertheim's for uterine cancer, but when these operations are excluded the mortality is still 6 per cent. He considers that the increase is mainly due to pulmonary embolism, which caused eighteen deaths in 1,802 operations, and he attributes it to the systematic use of Trendelenburg's position. By avoiding flexure of the legs and lowering of the shoulders, he only had three deaths in the following 806 operations. Olshausen agrees with Zweifel in his conclusions.

We are at the beginning of a period when other methods of treatment than surgery are being gradually opened up, but are we not rather closing our eyes to those aids which are already known to us? How many of us have tried to arrest hæmorrhage from fibromyomatous uteri, in cases refusing or unsuited for an abdominal operation, by transferring the patient to our electrical colleagues for exposure to X-rays? I have done so in both hospital and private cases, especially at menopause ages, with distinct success. The rays arrest ovulation and the formation of lutein tissue by action on the Graafian follicles, and arrest the growth of fibroids owing to that action and to special action upon the cells forming the fibroid itself. I have not yet had a chance of using X-ray in fibrosis uteri.

- Again, do we realize that a tube of radium inserted two or three times for twenty minutes into the crater cavity of an incurable uterine carcinoma, in many cases causes complete, though, so far as is yet known, only temporary relief, from pain and discharge.

Are we alive to the remarkable effect of electric heat and light baths in pelvic inflammations? They can be easily applied by fixing electric lamps to the ribs of a bed-cradle. These "baths" speedily relieve pelvic pain, and promote rapid absorption of both parametric and perimetric exudation, after the acute stage of the attack has passed.

Bacon said, "The whole art of medicine is observation." Observation in medicine in Bacon's time was almost purely clinical, and treatment largely empirical. The enthusiasm and hard work done by our Section, and by our younger members especially, is gradually unfolding the obscurities still remaining in obstetrics and gynæcology. The clinical facts now brought before us at our meetings are not, as in the early days of the Society, all that is recorded, but practically every such history is accompanied by a pathological and sometimes also a bacteriological report.

These, and the addition in suitable cases, such as the toxæmias of pregnancy, of the report of a chemical pathologist, will, I hope, ere long enable us to discover the still unknown causes of the many diseases we daily discuss, to some of which I have referred. And when we know the causation, our efforts both towards prevention and cure must have their due reward. The discovery of the toxin in toxæmic cases by means of a perfected physiological chemistry will point to its antidote, and diseases which now find us helpless will readily yield both to prevention and to treatment; diseases, also, such as puerperal eclampsia, now treated in critical cases by such different surgical procedures as

Cæsarean section, decapsulation of the kidneys, or even amputation of the breasts, according to the theory or caprice of the operator, will be successfully dealt with by rational methods. I trust that the Obstetric Section of the Royal Society of Medicine will help in no small measure to an explanation of the many problems which are still eluding us.

DISCUSSION.

Sir FRANCIS CHAMPNEYS moved the usual resolution that the President be thanked for his address, and that he be asked to allow it to be printed, in no perfunctory spirit; for the address, with its summary of the past, its statement of the present condition, and its look into the future of the Section, was of very great interest. He congratulated the Section on its new President, who had worked in so public-spirited a manner for it, and he anticipated a happy and prosperous year under his guidance.

Dr. HERMAN asked permission to second the resolution proposed by Sir Francis Champneys, and wished to associate himself with the eulogistic phrases which Sir Francis had applied to the President's useful and stimulating address. He thought the Section was to be congratulated upon its new President.

**Hæmatosalpinx and Hæmatometra, Bicornute Uterus.
Atresia of the Vagina and Cervix Uteri.**

By FREDERICK J. MCCANN, F.R.C.S.

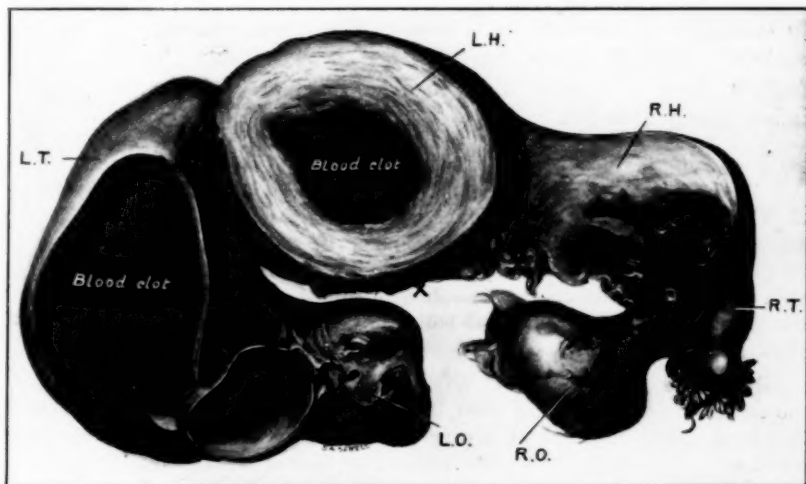
THE specimen was removed from a healthy-looking young woman, aged 20. She was sent into the Samaritan Free Hospital on account of severe pain in the left side of the abdomen below the umbilicus which extended down the left leg. This pain, which was increasing in severity, has recurred every month, lasting one week, ever since she was aged 17. She gave a realistic description, stating that when the pain was severe she felt that "if she strained something was sure to go." In the intervals of the attacks there was complete absence of pain. She is the eldest of four sisters, two aged 13 and 17 respectively menstruate regularly, whilst the youngest sister is aged 8. She has two brothers who are healthy. No history of deformities in the family could be obtained.

Examination: Her general development was good, the breasts were well developed, and the pubic hair normal. A well-formed, crescentic hymen was seen, but there was complete atresia of the vagina. Under anæsthesia the recto-abdominal examination revealed the presence of a swelling in the position of the uterus, suggesting the possibility of a bicornute uterus. An attempt was made by careful separation in the line of the vagina to establish a communication with the uterus, but on further examining the relations of the swelling I decided that it would be best to open the abdomen and deal with the condition from above.

At a latter date, June 30, 1910, the abdomen was opened in the middle line. There was evidence of considerable localized peritonitis, the intestine adhered to the pelvic mass, and a serous peritoneal cyst of some size had formed. The left tube, dilated and darkened in colour, was connected with a central bicornute swelling, the horns of which were unequal in size. To the smaller horn on the right side the right tube was attached. The ovaries were small and apparently normal. The whole mass was then removed and the operation completed. She made a smooth recovery.

Description of Specimen: In the accompanying drawing the specimen is represented as seen from behind. The left cornu of the uterus

measured 2 in. vertically by $2\frac{1}{4}$ in. horizontally: its posterior wall has been removed to show the cavity which was filled with firm red clot. The walls were from $\frac{1}{2}$ in. to $3\frac{3}{4}$ in. in thickness. The left Fallopian tube was much dilated, and when opened contained a still larger, firm, red clot, but its walls were not markedly thickened. At its outer extremity there was a thin-walled cyst 1 in. in long diameter, with shiny lining membrane. The left ovary, well developed, lay internally beyond the cyst, and its anterior part contained a corpus luteum. The right Fallopian tube possessed well-developed fimbriæ, and was con-



Hæmatosalpinx and hæmatometra. Posterior view ($\times \frac{2}{11}$). Sections have been made into the left tube and horns of the uterus. L.T., dilated left tube; L.H., left uterine horn; R.H., right uterine horn, the cavity of which was obliterated; R.T., right Fallopian tube; R.O., right ovary; L.O., left ovary; X indicates position of the cervix uteri.

tinuous with an elongated, broad, thick, solid tract of tissue made up, as proved by microscopic examination, of plain muscle-fibre. This tissue evidently represents the right cornu of the uterus and is continuous with its fellow. The right ovary was situated below and was much smaller than that on the left side, but contained follicles. A band of tissue representing the utero-ovarian ligament ran from the ovary to the rudimentary right horn.

This specimen serves to emphasize the importance of adopting the
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abdominal route in the treatment of such abnormalities, as a full view of the actual condition is obtained.

It might be suggested that the ovaries should have been conserved, as they appeared to be normal. Pain was the chief complaint of the patient, and if it had persisted the result would have been disappointing to her. For this reason a complete removal of the internal genital organs was adopted.

The specimen is further of interest in connexion with the causation of atresia of the vagina, and I am disposed to think that it is an example of inflammatory atresia where vaginal inflammation in early life has led to occlusion of the vaginal canal, and also in this instance to occlusion of the cervix and one of the uterine horns. It is the custom to speak of these examples of atresia as congenital, but I believe further study will show that in many instances they result from inflammatory changes.

DISCUSSION.

The PRESIDENT (Dr. Amand Routh) had seen two cases of absent vagina associated with recurring dysmenorrhœal pain. In both cases he had dissected up the tissues in the thickened recto-urethral septum, and had let out viscid fluid from the uterine cavity, but attempts to keep the pseudo-vagina patent had failed owing to the fact that both the patients were mentally deficient. He thought most of such cases were congenital in origin.

Dr. ARTHUR GILES said that he gathered from Dr. McCann's account that the vagina was not merely occluded, but absent, and this rendered it probable that it should be regarded as a congenital malformation rather than as the result of inflammation; this view received additional support from the fact that there was another malformation present—namely, doubling of the uterus. Recently he had come across a case, reported in the *British Medical Journal* for September 29, where there was absence of the vagina associated with a left inguinal swelling. He made a perineal dissection and tried to establish communication with the cervix, but after reaching a depth of about 2 in. between the bladder and the rectum, he gave up the attempt as not being feasible; turning to the left inguinal swelling, he found that it consisted of hernia of the uterus. In such cases as this and the one reported by Dr. McCann, the inflammatory theory of the vaginal occlusion seemed to him the more difficult of acceptance.

Dr. HERMAN said he had published in a now defunct medical periodical, *The Scalpel*¹ (edited by the late Dr. T. M. Dolan, of Halifax), a report of a case under his care, of hæmatometra, due to extensive obliteration of the lower part of the vagina. In that case he amputated the body of the uterus, with

¹ September, 1899, p. 292 (in Library of Royal College of Surgeons).

the tubes and ovaries, and stitched the stump to the abdominal incision; so that, when the operation was complete, the patient was left with a genital canal opening on to the abdominal wall instead of between the labia. The operation was entirely successful. The wound healed, and the utero-vaginal canal became obliterated; an event which, to his mind, supported the view that the occlusion of the lower part was of inflammatory origin, for he did not think that a utero-vaginal canal, lined with healthy mucous membrane, would have become so completely obliterated. He thought that Dr. McCann was entirely right in his treatment of his case; for when there was malformation of such extent as to make normal marriage, pregnancy and childbirth impossible, the patient was much better without her ovaries, which were then useless and only a potentiality of disease.

Dr. HUBERT ROBERTS did not agree with Dr. McCann as to the causation of such cases. Dr. Roberts believed them to be congenital in origin and not acquired, for instances occurred where occlusion of the vagina occurred in infants, leading to collections of muco-pus in the vagina, simulating hæmato-colpos in the adult. Dr. Roberts had seen such a case at St. Bartholomew's Hospital, and drawings of the viscera were published in his book on "Gynæcological Pathology"; the infant, aged 7 weeks, was too ill for any operation, and died in the hospital. An abdominal tumour was present, giving rise to retention of urine. Post-mortem examination showed a large distended vagina, occluded at its lower end and distended with purulent fluid. The tumour had caused great distension of the ureters and kidneys from pressure. A small uterus was perched on the top of the sac. In this case the vaginal atresia was certainly congenital. Dr. Roberts had operated on older cases in order to evacuate menstrual fluid, and agreed with Dr. McCann as to the difficulty in maintaining the patency of the vaginal canal afterwards, especially if a deep perineal dissection was necessary. As to the question of removing the uterus and ovaries in order to cure such a condition, Dr. Roberts thought it might be justifiable if menstruation went on and other means failed to secure patency of the vagina. Dr. Roberts agreed with Dr. Giles that the co-existence of other abnormalities of the uterus, tubes, or ovaries in such cases pointed to a congenital origin and not an acquired one. Acquired atresia of the vagina was quite possible after difficult instrumental deliveries, due to puerperal sloughing with subsequent contraction of scar tissue.

Dr. MCCANN, in reply, said that his reason for suggesting previous inflammation as the cause of the vaginal atresia was that at the upper end of the vagina where it was cut across there was a suggestion of a cavity. The whole question was one of considerable interest, and recent investigations tended to support the inflammatory theory. For instance, examples were recorded of double genital organs where one half was occluded as a result of previous inflammation. As to the formation of scar tissue and firm fibrous union, examples of labial atresia might be mentioned in adults where on dividing the adherent labia, the hymen, &c., were disclosed in a normal condition. Such were admitted to be inflammatory in origin.

Fibroma of the Pelvic Fascia forming a large Perineal Tumour.

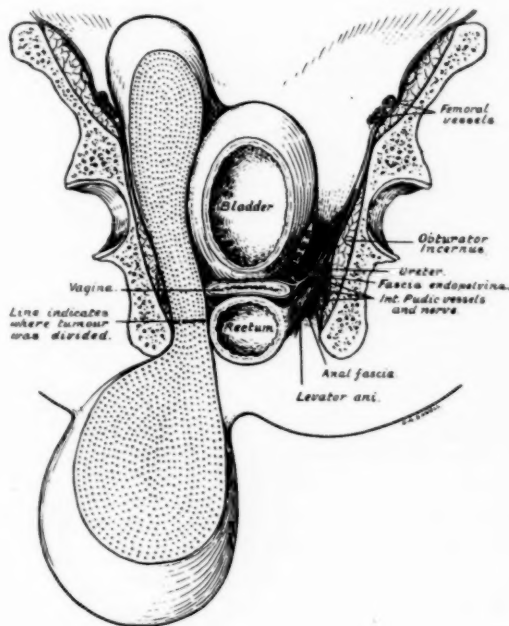
By FREDERICK J. MCCANN, F.R.C.S.

THE patient was a tall, slender, anæmic woman, aged 54, who was unmarried. Her menstruation had always been irregular, and during the last few years had only recurred every three or four months. In January, 1910, there was a profuse hæmorrhage which ceased and no bleeding recurred until June, when another profuse hæmorrhage occurred, the bleeding continuing incessantly until her admission into the Samaritan Hospital in October, 1910. When first seen she was obviously suffering from the continued loss of blood which had caused her anæmia, and she was unable to sit in comfort in consequence of a large pendulous perineal tumour.

On abdominal examination a central, movable, smooth, elastic tumour was felt extending upwards to the midpoint between the umbilicus and xiphisternum, which subsequent bimanual examination proved to be a uterine myoma. The tumour which caused the discomfort in sitting was found to be about the size of a cocoanut, covered with normal skin and hanging down from the left side of the perineal region for a distance of about 6 in. It was soft, almost fluctuating, not lobulated, and at its lower pole the skin adhered to it. It was partially reducible upwards towards the cavity of the pelvis, but no gurgle could be observed. It was dull on percussion and there was no definite impulse on coughing. This tumour had been undergoing gradual enlargement for six or seven years; however, since January, 1910, it had markedly increased in size. A certain increase in its size had also been noticed during her menstruation, whilst for the last six months there was difficulty in micturition, indeed, the patient said "there seemed to be a stoppage." A slight amount of pain was felt in the tumour, but her chief complaint was discomfort due to its size and position.

Operation: On November 4, 1910, assisted by my colleague Dr. Willett, I opened the abdomen and removed the myoma by supra-vaginal hysterectomy. A soft swelling was found occupying the left side of the pelvis anteriorly, being closely connected with the bladder and extending about 2 in. above the summit of that organ. It lay in front of the left broad ligament underneath the peritoneum. The

peritoneum was accordingly incised over it and its enucleation begun. Special care was taken to secure the vessels running into it in order to prevent undue loss of blood. The connexion with the left side of the bladder was so intimate that the muscular coat was torn during the process of separation and required to be reinforced by catgut sutures. As the enucleation proceeded the tumour was found to be continuous with the perineal growth and appeared to pass through a



Fibroma of the pelvic fascia. Coronal section of the pelvis, viewed from behind, showing, on the left side, position occupied by the tumour, and, on the right side, arrangement of pelvic fasciæ.

large foramen in the pelvic fascia. The fingers could then be passed through this foramen into the perineal region. At this stage of the operation my colleague, Mr. Butler-Smythe, kindly rendered considerable assistance by pushing up the tumour from below. It was obvious, however, that the more intimate connexion with the cutaneous structures which existed at the lower pole of the tumour rendered

complete enucleation from above extremely difficult. Accordingly the elongated enucleated portion of the growth was cut off and all bleeding arrested. A piece of double cyanide gauze was inserted into the cavity and the peritoneum accurately stitched across the cervical stump and the pelvis on the left side. The abdominal wall was then closed in layers and the patient placed in the lithotomy position. An incision was now made over the centre of the perineal portion of the tumour and the remains of the tumour gradually enucleated. The hæmorrhoidal vessels being secured early, the amount of hæmorrhage was inconsiderable. Some bleeding points in the cavity required ligature and some deep obliterating catgut sutures were passed in order to diminish its size. The end of the piece of gauze which had been inserted from above was brought through the lower incision and an additional gauze strip inserted previous to the closure of the skin wound. The gauze was removed in forty-eight hours.

She made a smooth recovery and was discharged from hospital on November 18, 1910. She has remained well and is able to do her work as a lady's maid.

Description of the Tumour: When the two portions of the tumour were put into position after removal, the whole formed a solid mass of irregular outline, and of the consistence of a firm jelly; whilst on section the surface was pinkish white and glistening. The upper portion was elongated, resembling in shape a greatly enlarged kidney; whilst the lower portion was broad and irregularly rounded. In both portions the surface was ragged and the texture exceedingly loose. Since its preservation the specimen has shrunk considerably, so that its original size is not truly represented. At present it measures transversely and antero-posteriorly at its middle or broadest portion about 6 in. and 9 in. vertically. Microscopically it consists of pure fibrous tissue, without any muscle-cells or sarcomatous or carcinomatous elements.

Soft fibromata have been described as growing from the perineal region in both sexes, and from the labia in the female, in the latter situation attaining considerable size. I have, however, failed to find in the literature any reference to an example where the tumour occupied a position in the pelvic cavity similar to what has been described.

In the *American Journal of Obstetrics* for January, 1897, p. 128, a case is narrated where a tumour weighing 4 oz. was removed from a white woman, aged 37, the mother of one child. It is described as being the size of an egg and growing between the vulva and anus. The rectum was torn during its removal, and it was found to have extended

for a distance of 5 in. into the pelvis. It was reported to be a soft fibroma.

A paravaginal fibromyoma, weighing 2½ lb., removed from a woman, aged 36, was exhibited by me before this Section, and is recorded in the *Proceedings* in July, 1908.¹ This tumour had extended upwards into the pelvis, and was palpable by abdominal examination. It seemed to have pushed the uterus and corresponding broad ligament upwards, and possessing a distinct capsule was not difficult to enucleate. In the present instance, however, enucleation was more difficult, especially the lower portion of the tumour, for there appeared to be actual infiltration of the fatty tissues. This diffuse character of the tumour simulated what is known regarding soft fibromata of the skin. Indeed, the close connexion of the tumour with the bladder indicated actual infiltration of the vesical wall. In like manner the tumour had infiltrated the subcutaneous tissues. From the consistence of the tumour, it is easy to understand how it could be packed into the pelvis without leading to much disturbance of surrounding organs.

The two cases I have now recorded definitely establish the fact that there is a variety of tumour composed of fibrous or fibro-muscular tissue originating in the pelvic connective tissues and tending to grow both upwards towards the abdominal cavity and principally downwards towards the perineal region, forming in this situation a definite tumour. Further, that this variety of tumour may be encapsuled and relatively easy to shell out, or diffuse, giving rise to corresponding difficulty.

The rate of growth appears to be slow, and owing to their soft consistence, pressure effects are not marked, especially as the tendency to increased growth is in the downward direction, where subsequent enlargement is not hampered by the pelvis and its contents.

In both examples there was no connexion with the uterus or broad ligaments.

Dr. McCANN stated that the tumour had probably originated from the visceral layer of the pelvic fascia, and by its growth had produced the foramen, through which the hand could be passed. By the visceral layer of pelvic fascia he meant that layer which passes inwards from the parietal layer at the white line. After a prolonged search of the literature he had been unable to find any record of a similar case.

¹ *Proc. Roy. Soc. Med. (Obstet. Sect.)*, 1908, i, p. 321.

A large Fibrocystic Tumour distending the left Buttock and continuous with Tumours in the Vagina and in the Abdomen.

By JOHN D. MALCOLM, F.R.C.S.Edin.

A WOMAN, aged 30, the mother of one child 11 years old, was admitted to the Samaritan Free Hospital on April 7, 1911. Six years earlier she had difficulty in passing water and was sent to a hospital under the care of an experienced surgeon who has kindly informed me that she then had a lax cyst to the left of the vagina and another swelling behind the uterus on the same side. It was thought that there was a second vagina which might contain pus, and an incision was made into the lower swelling, but no pus was found and very little fluid. The patient was discharged a month later, and was requested to return for further examination.

A fortnight after she went home a tumour came down in the vagina suddenly without pain or hæmorrhage when she was stooping to clean a fireplace. A year later another surgeon of large experience was consulted, and I am indebted to him for the knowledge that the patient then had three swellings respectively in the vagina, in the buttock, and in the abdomen. The growths were quite small and did not interfere with the patient's movements at that time. Soon afterwards it was necessary to have the water drawn off by catheter, and except on this one occasion the woman did not consult any medical man from July, 1906, until April, 1911, although she was unable to sit upon a chair for nearly four years.

Her story was that the swellings enlarged until the abdomen was as big as that of a woman seven months' pregnant, and the tumour of the buttock was about half the size to which it ultimately attained. In August, 1910, she suffered from severe diarrhœa with blood in the stools, which continued for four days, and then the abdomen suddenly diminished almost to its proper size, and at the same time the lower tumour increased enormously in bulk. In the evening, after this change took place, the woman, in a fit of desperation, attacked the larger external tumour with the blunt end of a hatpin, striking it many times until she became exhausted, but apparently without breaking the skin. Next

morning her bed was soaked in fluid, an escape of which occurred on other occasions and gave relief. Such a discharge was observed in the hospital and it consisted of a serous exudation from the skin. After the size of the abdomen diminished the patient was more comfortable, and she was always able to get about, although with increasing difficulty.



FIG. 1.

Large fibrocystic tumour. The anus is shown on the tumour wall, just below the right buttock. The vaginal tumour is out of sight.

Latterly, she carried her tumour in a piece of sheeting attached to her waist, but went out only after dark because the growth could not be hidden. The bowels were kept open by laxative medicine. After admission to hospital catheter specimens of the urine had a specific

gravity of 1020 to 1025, and were sometimes free from albumin; sometimes they contained a trace, which was attributed to accidental contamination. Micturition and defæcation were very difficult processes. The other systems were healthy, but the patient was thin and anæmic.

When the woman was in bed, on her hands and knees, particularly if the legs were more or less out of sight behind the tumours and the bedclothes, the posterior part of her body appeared to rest upon the end of the growth, and the hind-quarters sometimes bore a close resemblance to those of a seal, so that the ignorant, especially if they only caught a glimpse of these parts, might easily have imagined that they had seen a creature half-woman and half-animal.

The larger external tumour was attached to the left side of the anus and to the left buttock. Its dimensions were as follows: Greatest perpendicular measurement from sacrum to pubes, $37\frac{1}{4}$ in.; greatest horizontal circumference, $35\frac{1}{2}$ in.; smallest circumference of neck, 29 in. It was entirely covered by skin, the distal part of which had a scaly appearance as if from a prolonged, recently healed eczema, and it was not broken anywhere. In the recumbent position the anus was not seen until the tumour was pulled away from the opposite buttock. It was so dragged upon that the mucous membrane of the left side was exposed and very tender. When the patient stood erect the anus was still further pulled down and became visible below the right buttock. Digital examination of the rectum caused severe pain, and the finger did not pass upwards into the pelvis, but downwards into the external mass of tissue. Percussion over the upper part of the tumour adjacent to the anus showed that there was an area of resonance measuring about 6 in. by 4 in., but varying in extent.

The smaller external growth was attached to the left posterior aspect of the vagina, well within the ostium, which was much distended. This tumour had a constriction near its base and its measurements were: in largest diameter, $14\frac{1}{2}$ in.; in circumference of neck, $9\frac{3}{4}$ in.; in length, $7\frac{1}{2}$ in. It was covered by mucous membrane, and its distal portion showed an extensive area of ulceration resembling that so commonly seen on a prolapsed uterus, which, at first glance, it was supposed to be. The vagina above the site of origin of this tumour did not appear to be affected or even displaced. The cervix uteri was in normal position and the passage of a sound showed that the fundus was fairly well forward, but it could not be felt by a hand upon the abdominal wall. The abdomen was uniformly, but only slightly, enlarged, and

there was an area of dullness above the pubes rising nearly to the umbilicus, but no definite tumour was marked out by palpation. Behind and to the left of the vagina there was an abnormal ill-defined thickening of the tissue, as if there was an isthmus of new growth extending from the internal to the external parts. The tumour in the



FIG. 2.

Large fibrocystic tumour with the vaginal tumour exposed, showing the extensive surface of ulceration.

vagina seemed also to be attached to this junction between the two other growths. The large external mass appeared to be either cystic or a very soft growth which contained some cysts. It became obviously more tense when the patient strained. The vaginal tumour seemed to be a soft solid mass. The patient complained of no pain except in

the anus when it was examined and when the bowels moved. She was wonderfully cheerful.

These conditions were seen by most of my colleagues, and amongst others by Sir Francis Champneys, who examined the patient with me after she had been anæsthetized, and he kindly permits me to say that, in his opinion, the tumour was fibro-cellular and subperitoneal and that it occupied the abdomen and came down into the buttock. He also agreed that an attempt should be made to remove it. The very serious nature of the proposed operation was clearly explained to the patient, and she was anxious to have it performed.

The proceeding consisted of making a circular incision round the large external tumour, well away from its base and from the resonant area. The skin and a layer of fat were divided, and there was another well-marked deeper capsule, within which Douglas's pouch was opened, and a large mass of soft, shapeless material like a congeries of big coils of intestine matted together was exposed. This was not intestine, and was not in the pouch of Douglas, but extraperitoneal, and it consisted of elongated, thin-walled cavities containing, but not distended by, a thin, clear, yellowish fluid. The rectum was easily defined and avoided, there being a layer of loose connective tissue between it and the new growth.

As it was clear that the tumour could not all be enucleated from below, an incision was made in the middle line of the abdomen above the pubes, and a new growth was exposed very closely adherent to the left side of the bladder, which was raised high up towards the umbilicus. In separating these the bladder was opened accidentally, although its position had been defined by passing a catheter into it. The opening was immediately closed, and was in itself unimportant. The abdominal tumour rose as high as the umbilicus. It was soft and somewhat flat, like a thick cake, and it lay altogether in front of the abdominal cavity. There was another smaller, rounder growth behind the uterus. Neither of these expanded the broad ligament. All the tumours met in a narrow portion in the anterior part of the left side of the pelvis, and they were removed, two from above and two from below, with the exception of a small piece at their point of junction. After many vessels were ligatured the incisions were closed, the great cavity in the external wound being drained. Several of my colleagues kindly joined in adopting the usual measures for preventing shock, and the patient was put to bed alive, but the operation had been an exceedingly severe one, and she died about half an hour later.

A post-mortem examination was obtained and it was then discovered

that the ureters were dilated to a diameter of half an inch, and the kidneys and their pelves were also enlarged. All the other organs appeared healthy, but of course anæmic. The remaining portion of the new growth was removed. This part was very narrow, not more than an inch in diameter, and it was held firmly against the anterior portion of the left side of the pelvic brim. There was no difficulty in separating it from any hollow viscus, or from the bone and muscles external to it, but it was adherent to, and apparently continuous with, the fascial structures covering these muscles, and which seemed to hold it in position. Its removal laid bare the ascending ramus of the left pubic bone and the obturator vessels and nerve.

The parts removed at the operation after much fluid had drained from them weighed $39\frac{1}{2}$ lb. All the solid parts consisted of a soft, very cellular fibroid tissue, and Mr. Shattock discovered some unstriped muscle-fibres in parts of the lower growth. The vaginal tumour has been preserved in the Royal College of Surgeons. It is solid and has shrunk very much. The larger external mass had a solid area about 4 in. thick below the cystic part, and this (a portion of which was exhibited) lay on a table as a flat piece of growth pliable in any direction. This solid part was clearly an expansion of some portion of the floor of the pelvis, and it was continuous with the inner capsule, mentioned in describing the removal of the tumour, which undoubtedly was the greatly thickened pelvic floor expanded over the cystic portion of the growth.

It is not easy to form any opinion as to the exact site from which this remarkable tumour arose. A soft, solid, or cystic growth behind the uterus and another beside the vagina existed six years before the patient was first seen by me, and it would appear that the paravaginal growth rapidly escaped through the cicatricial tissue formed after an incision was made into it from the vagina. Probably these were the first parts to develop. The anterior abdominal and the larger external masses seem to have consisted of an extension of new growth along the fascial planes upwards and downwards. The large cystic portion was attached to the upper surface of the new growth which developed along the fascia of the pelvic floor, and apparently invaded the muscular tissues also. Probably this cystic portion was dragged or pushed down out of the pelvis and abdomen during the straining excited by the attack of diarrhœa in August, 1910. The pouch of Douglas and its contents were necessarily displaced as the pelvic floor descended. In the lower abdomen and about the brim of the pelvis the muscular structures

forming the abdominal and pelvic wall were completely laid bare by the removal of the growth. Chiefly for this reason I would hazard the conjecture that the tumours grew from fascial tissue. They showed no sign of malignancy except the obvious tendency to continuous growth, and the fact that the patient remained so comparatively well arose from the absence of pressure upon any important organs except the urinary tract. The urethra appears to have been first pressed upon, but the pressure seemed rather to diminish as the growth enlarged. At any rate the need for catheterization ceased.

The great danger of the operation was due to the delay in operating, which allowed the abnormal renal condition to develop, with a consequent anæmia and depreciation of resisting power in the body, and which necessitated an excessive manipulation in removing the growths.

When I saw the patient she was convinced that surgical interference offered the only hope of recovery. At an early stage of the illness this was not so obvious, and it was most unfortunate that she did not afford the fullest opportunities for considering her case to one of the surgeons whom she consulted in 1905 and 1906, or to some other surgeon at an earlier date. When these tumours were of moderate size it would, in my opinion, have been sound practice to have examined them from within the abdomen, and this procedure would in all probability have been followed by their removal, and by a complete cure of the patient.

DISCUSSION.

Dr. HERBERT SPENCER said this remarkable case had been under his care about six years ago at University College Hospital. At that time there was no external tumour, and only a small cystic tumour to the left of the vagina and a very indefinite swelling in the situation of the left broad ligament. The patient was in perfect health and complained only of slight difficulty in micturition. Regarding the case as a vaginal cyst, with probable extension into the broad ligament, he had cut into it below and found a soft fibrous wall enclosing a tubular cavity which admitted the forefinger and a sound in an upward direction for 4 in. Though the smooth lining of the cavity somewhat puzzled him, and he regretted not having cut a section of the wall, he regarded the case then as probably a closed accessory vagina, and tied a large tube in to drain it. He had not seen the patient since her convalescence, but having heard that the tumour was growing externally, he had written to the patient to come back to him for further treatment, but the patient declined to come, although advised to do so by a surgeon under whose care she had placed herself. It was now evident that the tubular cavity which he had opened was

degenerative cyst in the soft fibroid. The enormous dimensions of the tumour shown necessarily rendered the operation very dangerous; but, as far as he was concerned, it was the refusal of the patient to return which prevented an earlier operation.

Mr. ALBAN DORAN noted that these large "paravaginal tumours" were of the same type, anatomically and pathologically, as the fibromata and fibromyomata of the broad ligament independent of the uterus, which in turn were homologues of the fibromata and fibromyomata which developed behind the mesentery. Paravaginal, mesometric, and mesenteric tumours of great size had been described by Fellows of the Section, including himself.¹ The tumour usually gave trouble to the operator because it rarely caused pain to the patient, and she consequently deferred medical advice until it had become inconvenient owing to its bulk. This bulkiness involved obvious operative difficulties and dangers. The true fibroma, myoma, or mixed tumour of the vagina developed in the vaginal canal itself—in the duct of Müller, in fact—and so did the homologue, the common uterine fibroid. It grew very slowly, but gave inconvenience to the patient, so that she usually consulted a doctor before it had attained a large size. Its removal, by enucleation, seldom proved difficult. Thus the "paravaginal" and vaginal tumours, histologically the same, were quite different from an anatomical, clinical, and surgical point of view.

Mr. BUTLER-SMYTHE remarked on the rapid growth of such tumours as those before the meeting. He was peculiarly interested in these cases, inasmuch as he had had unusual opportunities for observation relative to the progress of the patients, and quite realized the difficulties with regard to diagnosing the actual conditions; and also because he had been fortunate enough to assist at both of these very formidable operations. In Mr. Malcolm's case the patient was delivered of her only child in 1902, and, so far as could be ascertained, no difficulties were met with at her confinement. Two years later she was said to be perfectly well and able to perform all her household duties. In May, 1905, the first evidence of pelvic trouble was noticed—"stoppage of her water," and this led to an examination which resulted in the discovery of a growth in the vaginal wall. It was quite evident that at the time of her first operation there were no large tumours, and yet a year later, when she presented herself for examination, three large swellings were found—one in her abdomen, another in her left buttock, and a third in her vagina. In 1911 these had increased to the enormous size shown in the photographs. In Dr. McCann's case the growth had been in existence for six years, but had rapidly increased in size within the last twelve months. In each instance the mode of descent was almost identical, the growth appearing beneath the pubic arch, advancing along the ramus of the ischium between the obturator fascia and muscle, and then extending into the gluteal region. Mr. Butler-Smythe believed with Dr.

¹ *Trans. Obstet. Soc. Lond.* (1899), 1900, xli, pp. 173-212, and *Brit. Med. Journ.*, 1904, ii, p. 1075.

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McCann that these tumours probably originated in the visceral layer of the pelvic fascia. Happily they were of rare occurrence, for even when recognized the operation for their removal required more than ordinary skill.

Mr. MALCOLM, in reply, said that he quite agreed, and had stated in the paper that it was a pity the patient did not give the surgeons she consulted in 1905 and 1906 every opportunity for considering her case, and did not even urge with importunity that they, or some other surgeon, should reconsider her condition at an earlier date.

Tubal Pregnancy in the Fourth Month of Gestation ; Removal of the Unruptured Sac.

By R. DRUMMOND MAXWELL, M.D.

CLINICAL HISTORY: C. B., aged 24, married five months. Menses regular before marriage. Last menstrual period, first week in May, 1911. No abnormal symptoms in May and June. Mid-July: Indefinite pain; vomiting; mass felt by patient rising a couple of inches out of the pelvis and to the left of the mid-line. This was thought by the patient to be the naturally enlarging uterus. August 2, 1911: A severe attack of pain occurred but passed off without medical assistance being sought. August 8: A severe attack of pain and vomiting occurred, associated with some collapse. Patient's medical attendant suspected ectopic gestation and sent her (to the writer) for confirmation of diagnosis. August 9: Patient seen in consultation, looking very ill and haggard; intense pain localized to well-defined swelling reaching half-way to umbilicus on left side of mid-line. General signs of pregnancy well marked. Both breasts active. *Per vaginam*: Marked softening of the cervix; uterus easily recognized; whole organ markedly enlarged, softened and pulpy; Hegar's sign not obtained in it. In the left fornix was detected the lower pole of the swelling previously felt abdominally. The mass, which pushed the uterus over to the right side, was perfectly mobile but intensely painful to the touch.

The diagnosis made was that of unruptured extra-uterine gestation sac (with a reservation for early pregnancy complicated by a twisted ovarian cyst). There was no bleeding from the uterus nor any history of it.

Laparotomy was performed within a few hours of first seeing the

patient. The large sac shown in the accompanying photograph was easily brought up to the wound-level; its pedicle, composed of the whole of the left broad ligament, allowed it free mobility. The left round ligament was seen running from the left cornu of the uterus, well to the inside of the sac with reference to the middle line of the pelvis. The proximal or isthmic portion of the left tube was unenlarged and normal in every respect. The only other additional proof of the essential tubal nature of the sac was seen in the unaltered infundibular portion of the tube. This with the normal ostium lay to the outer side of the sac. It is unfortunately not present in the specimen, as in one's

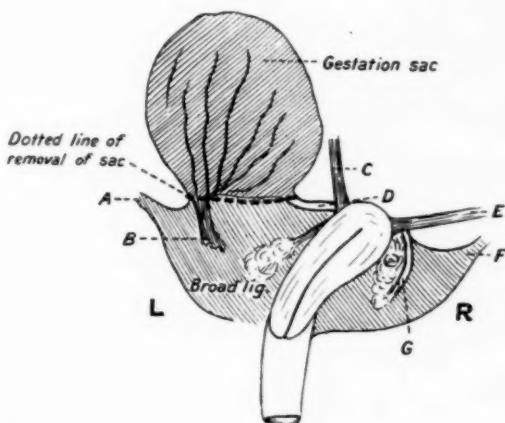


FIG. 1.

Unruptured tubal gestation, left side. Left salpingectomy. A, left infundibulo-pelvic ligament; B, outer end of tube with ostium 1 in., not removed with sac; C, left round ligament; D, left tube, isthmic portion 1 in.; E, right round ligament; F, right infundibulo-pelvic ligament.

anxiety to preserve the ovary and its circulation intact the outer inch of the tube was clamped off with the ovary. There was no free blood in the pelvis or any evidence of adhesions of the sac to contiguous viscera so frequently seen in these cases.

Dr. Maxwell thought the specimen worthy of bringing to the notice of the Section as an instance of unusual prolongation of pregnancy in an extra-uterine sac proved to be neither intraligamentary nor rudimentary horn. The well-marked general and local signs of pregnancy, with

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the absence of Hegar's sign, practically forced one to the diagnosis of ectopic pregnancy.

As regards evidence to be derived from the passage of a cast or shreds from the uterus in such cases, Dr. Maxwell stated that out of 150 cases in the London Hospital (Dr. Lewers and Dr. Russell Andrews), in only 5 to 6 per cent. was a cast passed before operation was performed. In the present case patient passed a complete decidual cast of the uterus two days after operation.

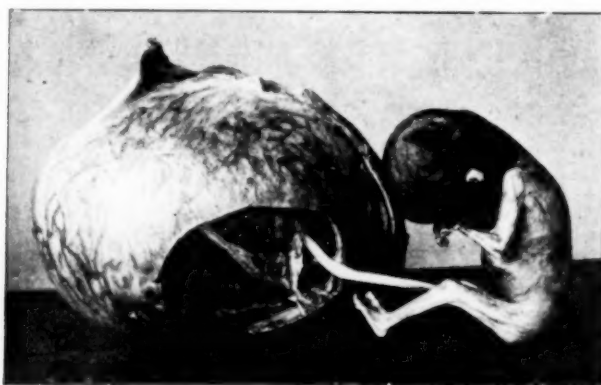


FIG. 2.

Tubal pregnancy in the fourth month of gestation.

Dr. HERMAN said that Dr. Maxwell's specimen, although accurately described as an unruptured tubal gestation, yet was not one in which the pregnancy had gone on like a normal uterine pregnancy. The wall of the tube was in a condition like that known as a tubal mole. The chorion or placenta was thrombosed. But the size of the fœtus showed that the placenta had been functionally active for an unusual length of time. He believed Dr. Maxwell's specimen was unique.

Obstetrical and Gynaecological Section.

November 3, 1911.

Dr. AMAND ROUTH, President of the Section, in the Chair.

Cancer of Uterus and One Ovary subsequent to Double Salpingectomy for Tuberculosis.

By WILLIAM TURNER, F.R.C.S., and CUTHBERT LOCKYER, M.D.

MRS. S., aged 50, seen February, 1910, complained of puffiness of hands and ankles, getting worse, with pains in the limbs for the past three or four months. In April, 1909, had operation for abscess in neck, which had not healed, and a sinus was found, $1\frac{1}{2}$ in. deep, just above the clavicle, and at outer border of the sterno-mastoid muscle. Cause not known, and supposed to be an acute abscess. The sinus and watery discharge appeared, however, to be more like one with a tuberculous deposit at the bottom.

Family history : One brother died of consumption.

Past history : Nothing of importance ; she had always led a very active life, and had never been laid up, except with abscess in the neck, as stated above.

Menstrual history : Always regular, and until 1906 quite normal. Has one son, aged 18. In 1906, periods more profuse until 1909, when they ceased ; in December a profuse period, and again in February, 1910.

Present condition : Thin woman, appetite fair, but complaining of much colic and flatulence, and inclined to be constipated. Heart and

lungs apparently normal. Urine normal. Abdomen distended, tympanitic, no fluid. *Per vaginam*: Cervix patulous and body of uterus enlarged; no tenderness, no discharge; sound passes $3\frac{1}{2}$ in. There is puffy swelling of the synovial membrane of wrists, carpal joints, and slightly of ankles.

On March 8, 1910, laparotomy performed; no peritoneal cavity found; all the peritoneum was adherent, and dotted over with small papillary growths; after careful separation of these adhesions, inflammatory masses were found in the pelvis and the ovaries were found to be normal, but the tubes were very thickened and matted. The uterus was entirely fixed, and could not be separated from the bladder, and so the tubes were removed for microscopical examination, as it was not certain, from the macroscopical appearance of the papillomata, whether they were tuberculous, or of secondary carcinomatous type. The small intestine was kinked, and adherent throughout its length, and had to be straightened out before the wound was closed. The uterus and ovaries *were not* removed. The sinus in the neck was explored, and found to lead to a tuberculous gland, with a caseating mass in it.

After-history: The patient caused much anxiety for the first three weeks, and then was put on a course of tuberculin, $\frac{1}{5000}$ mgrm. every ten days, and steadily gained ground. An occasional blood-stained discharge was noticed from the vagina, but no bleedings. A large swelling, the size of a hen's egg, developed on the periosteum of the eighth rib on the left side, but it did not suppurate, and gradually subsided. In November, 1910, the general condition was excellent; wrists practically normal, uterus no larger, and swelling on ribs practically gone. The patient then left for the south of France, and stayed there until April, 1911. In January she had a hæmorrhage, and again in March, and the bloodstained, non-smelling discharge became more profuse and constant. When examined in April, the uterus was found much enlarged, and was felt in the hypogastrium, with a mass attached to it on the right side. Operation was refused, and only agreed to on June 18, when the fundus uteri was felt to the left side of the hypogastrium, and there was a large mass occupying the pelvis, pushing the uterus over to the left. Laparotomy was performed on June 18, and no evidence of the tuberculous peritonitis was discovered, and the uterus and ovaries were removed.

The patient has made an uninterrupted recovery, and is now quite well. The gland and both tubes *were* tuberculous.

REPORT BY DR. LOCKYER.

Macroscopical: The two specimens examined by me are as follows: (1) The uterus and right appendages; (2) the left ovary. The uterus is much enlarged by what appears to be two malignant growths, one in the cervix and one in the body. The entire organ measures from above downwards 6 in., and from cornu to cornu 4 in. The muscular walls of the uterine body and cervix average $1\frac{1}{4}$ in. in thickness. The growth in the body projects from the cavity as a papillary mass, it occupies the whole of the cavum uteri, which has been expanded thereby so as to measure 2 in. transversely and $2\frac{1}{2}$ in. vertically. The cervical growth is surrounded below by the normal epithelium of the vaginal portion of the cervix, it is confluent with the latter along the right side of its posterior surface, and extends up the whole of the canal as a ragged lobular mass. This growth does not present the same papillary surface as that seen in the corporeal tumour, nor does it appear to extend upwards high enough to become confluent with the latter, but this point will be settled by microscopical section. The cervical growth appears to have started in the glands of the cervix and not in the squamous epithelium covering the portio vaginalis. The right appendages show three-fourths of the tube to be missing, the inner fourth has now been removed for purposes of histological investigation. The right ovary is small and calls for no comment. The back of the uterus is roughened by adhesions. There is no vaginal tissue attached to the cervix. The left ovary forms a semi-solid growth 10 in. in circumference. The outer surface presents some filmy adhesions and at its upper pole there is a rupture measuring $\frac{3}{4}$ in. in diameter. From this some papilliferous tissue is seen to project. On section this growth presents several cystic spaces filled by intracystic papillomatous new growth. These papillomatous ingrowths are pushing their way amongst the pseudo-mucinous material which forms the contents of the cystic spaces.

Histological: The cervix—The section has been taken vertically so as to show the epithelium of the vaginal portion and that of the cervical canal. The former is seen to be quite normal and the latter, as far as is traceable, is normal likewise. In the substance of the cervical wall at a distance from the surface there is a carcinomatous growth which has taken origin from the glands and has formed malignant masses composed of tubules which branch and ramify in the fibro-muscular stroma. Large alveolar spaces also exist. These are lined by

proliferating columnar epithelium or are sometimes filled up by cancer cells. The corporeal growth is remarkable for the extreme centrifugal proliferation and the almost total absence of centripetal growth—i.e., of invasion of muscle. It is therefore, strictly speaking, a diffuse papillomatous growth involving the entire surface of the uterine cavity. The epithelium has, however, broken through the basement membrane to form irregular masses of cells, hence the papillomatous tissue must be considered malignant. A section taken through the tissue between the cervical and corporeal growths show that they are confluent, but the former invades the cervix freely, and is by origin and structure an adenocarcinoma of tubular type. The ovary—The solid portions of this organ show histologically the simple structure of a papilliferous adenoma side by side with densely packed carcinomatous cells in alveoli. The glandular cancer cell masses are extensively necrosed, but areas exist where the malignant process is distinctly traceable to the columnar epithelium of the tubules of the papilliferous gland processes. The stumps of the Fallopian tubes have been embedded, cut, and examined; they show no evidence whatever of tubercle. A copy of the report on these tubes, which was made on March 8, 1910, reads "Both tubes are the seats of tuberculosis. The systems exist in the plicæ and in the wall under the peritoneum."

Additional remarks: Dr. Lockyer discussed the relationship between the malignant ovarian tumours and the carcinoma of cervix and body of the uterus and stated that as in Mrs. Scharlieb's case, shown in July,¹ he was of opinion that the ovarian and uterine growths had occurred independently the one of the other. The tubes and mesosalpinges had been removed eighteen months previously to the final operation of hysterectomy and ovariectomy. The stumps of the tubes and adjacent uterine muscle contained no cancerous deposits, and the muscularis of the body of the uterus was not invaded by new growth. It was true the cervical growth had extensively eroded the muscle, but seeing that its origin was proved to be in the deep cervical glands, that was not surprising, and malignant disease of the ovary secondary to cervical cancer has not, so far as he knew, been observed. Benign epithelial growths of similar nature occurred simultaneously in different parts of the body, and the speaker sees no objection to accepting the same possibility in the case of malignant neoplasms.

¹ *Proceedings*, 1911, iv, p. 359.

DISCUSSION.

Dr. LOCKYER, in reply to Mr. Glendining, stated that he had made no investigations beyond those recorded in the report he had just given. Mr. Turner had drawn attention to the enlargement of the uterus in March, 1910 ($3\frac{1}{2}$ in.), before the tubes were removed, but the menstrual history subsequent to that date disproved the presence of carcinoma uteri up to within six months of the final operation of hysterectomy.

Mr. WILLIAM TURNER, in the course of a few remarks, said that the diagnosis of red degeneration of a fibroid of the body of the uterus was made from the clinical symptoms; and the risk of removing the uterus at the first operation, owing to the difficulties met with, did not seem worth taking. Malignancy was not suspected until nearly a year after the first operation, and then the ovary was already affected. He added that special interest in the case lay in the quiescence of the malignant growth during the period of active tuberculosis.

Diffuse Tuberculosis of the Uterus.

By C. HUBERT ROBERTS, M.D.

SECTIONS and drawings were shown of a case at the Samaritan Hospital for Women of diffuse tuberculous infection of a uterus, which was removed by operation from a single woman, aged 49. The case was taken to be one of fibroid of the uterus. The patient was curetted first in July, 1911, on account of bleeding. The uterus was then irregularly enlarged and the size of a foetal head. The curettings were not examined microscopically.

In August, 1911, the patient returned for further treatment, as the hæmorrhage had recurred and was worse than before the curetting. Abdominal section was performed under the belief that the patient had a fibroid and that removal was the only chance of curing the condition. The lungs were reported as healthy. The operation was a very difficult one owing to dense adhesions everywhere of intestine, omentum, and bladder to the uterus. No tubercle was noted on the peritoneum, nor was there any free fluid. On exposing the tumour a large hydrosalpinx was found on the left side and a smaller swelling (pyosalpinx) on the right. The enlarged uterus together with the diseased tubes and ovaries were removed by the supravaginal method.

The appendix vermiformis was adherent to the right tube and was so damaged that it was also removed as a precautionary measure.

During the operation the left infundibulo-pelvic ligament slipped and the ovarian artery retracted. This gave rise to a large hæmatoma which was very troublesome to deal with. Eventually, after turning out all the clot and plugging temporarily with gauze, the bleeding vessel was secured. The uterine cervical stump appeared healthy and was treated by apposition over it of the peritoneal flaps. The abdomen was closed in the usual way without drainage.

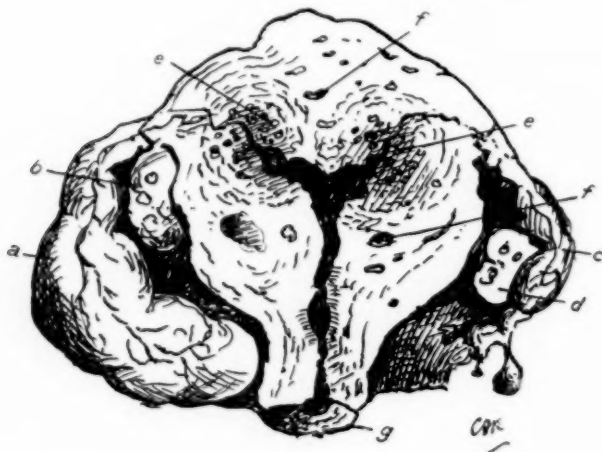


FIG. 1.

Drawing of specimen of diffuse tuberculosis of the uterus. *a*, hydrosalpinx (left); *b*, left ovary; *c*, right tube dilated (pyosalpinx); *d*, right ovary; *e*, *e*, curious areas of degeneration in body of uterus; *f*, *f*, small abscess cavities; *g*, cervix uteri.

The patient did well and has been seen several times lately. She reports herself as "quite cured." She was in the hospital one month.

Dr. Roberts was quite unaware of the nature of the tumour removed till after the patient had left the theatre as it was believed to be an ordinary fibroid. On cutting into it he found that the whole of the enlarged uterus was in a condition of necrosis. The uterine walls were very thick and the cut surfaces exhibited multiple areas of suppuration (fig. 1), out of which cheesy, worm-like bodies could be squeezed. The whole of the uterine muscle was affected to a greater or less

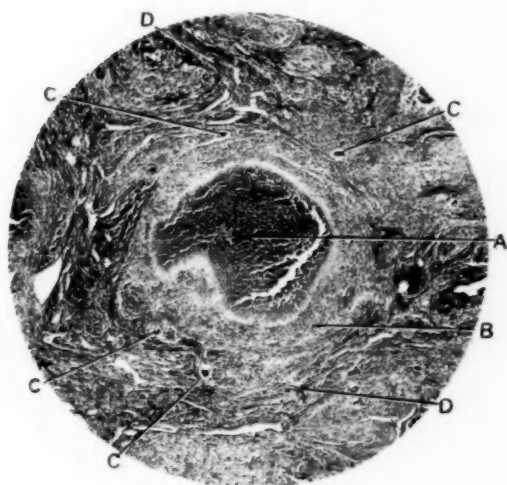


FIG. 2.

Section (low power) of uterine wall showing tuberculous deposit and areas of abscess formation deep in the musculature of the uterus. **A**, central caseous deposit breaking down; **B**, area of epithelioid cells; **C**, **C**, giant cells; **D**, **D**, remains of muscle cells.

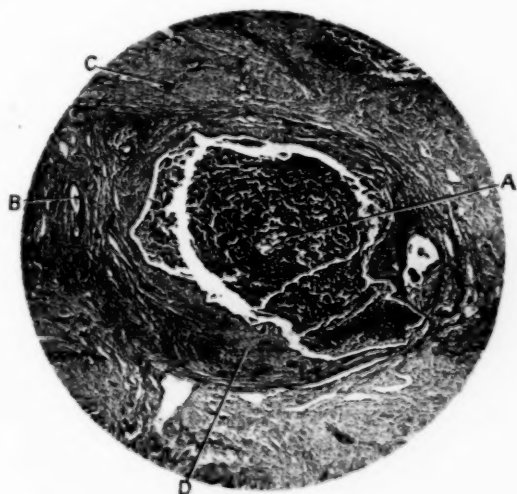


FIG. 3.

Section (higher power) showing one of the areas of suppuration in the muscle. **A**, central area of necrosis; **B**, vessel; **C**, a giant cell system; **D**, very degenerate muscular fibres.

degree by this process, which was most marked in the region of the cornua at the entrance of the Fallopian tubes. The cavity of the uterus was enlarged and necrotic, and contained puriform material. The right tube was swollen considerably and was converted into a hydrosalpinx. The left tube was smaller and contained pus, its walls being very thick.

Dr. Roberts showed a drawing (fig. 1) made at the time, together with microscopical sections of the uterine wall. These were demonstrated on the epidiascope. The specimen itself had unfortunately not been preserved owing to a mistake of the operating theatre sister who had forgotten to keep it. Sections of the uterine wall were of great interest as they exhibited diffuse tuberculous infection of the whole of the musculature of the uterus, which Dr. Roberts maintained was a very rare condition. The tuberculous process was exhibited by multiple foci of caseous degeneration with epithelioid cells and well-marked giant cell systems (figs. 2 and 3). The musculature of the uterus was practically destroyed. There were no miliary tubercles of the peritoneal surface or on the tubes. The mucosa was very necrotic, but here and there deep involution islands of fairly normal glandular epithelium could be detected.

Speaking of uterine tuberculosis, Dr. Roberts remarked that tubercle of the uterus was much rarer than tubercle of the tubes or ovaries. This case was of interest also, in that the brunt of the infection had fallen upon the *musculature* of the uterus as a diffuse infective process, which as far as Dr. Roberts could remember was extremely uncommon. Many cases of uterine tuberculosis had been described, but in most of them either the mucosa or peritoneum had been chiefly involved.

Dr. Roberts believed that this case was probably one of secondary infection from the tubes, and not a primary one. Primary tuberculosis of the genital tract in women was very rare, and probably only occurred in 8 to 10 per cent. of all cases. In tubercle of the *tubes* either the peritoneum was affected by miliary deposits, or more commonly the mucosa, in which case the fimbriated extremity was closed and hydro- or pyo-salpinx resulted. Mr. Targett and Dr. Roberts had shown specimens before the Section of banana-shaped tumours of this kind, and Mr. Targett had pointed out that careful serial sections should always be made of the *uterine* ends of such tubes, in order to demonstrate tubercle. Mere sections of the thickened walls, owing to degeneration or suppuration, might fail to demonstrate their origin. Tubercle of the

ovary showed itself generally as miliary surface deposit, or as an ovarian abscess.

Uterine tuberculosis, as before mentioned, might occur as affecting the endometrium, leading sometimes to pyometra, but *diffuse infection of the uterine wall*, as in the case described, was very uncommon. Primary tuberculosis of the cervix uteri is also a very rare condition and is ascribed to infection from coitus. Dr. Roberts's patient was a single woman, aged 49. Operations for uterine tuberculosis offered a fair prospect for recovery, provided the disease was localized to the pelvic organs. Complete removal was justified in such cases. The operations are often very difficult on account of the dense adhesions which usually exist.

DISCUSSION.

Dr. TATE showed a specimen of tuberculous disease of the cervix and Fallopian tube before the Obstetrical Society in 1904.¹ Six years before that the patient had had two operations performed for the removal of tuberculous glands in the neck, and when under Dr. Tate's care there were still some enlarged glands in the same situation. There was no doubt, therefore, that in his case the disease in the uterus and tubes was secondary.

Dr. INGLIS PARSONS asked if any sections of the uterus had been stained so as to show the presence or absence of tubercle bacilli.

Dr. ROBERTS, in reply, said there was no probability of seminal infection, and regretted that the sections had not been stained to demonstrate tubercle bacilli.

Specimen of Fibroma of the Uterus and Carcinoma of the Cervix.

By J. INGLIS PARSONS, M.D., and BRYDEN GLENDINING, M.S.

THE patient from whom the specimen shown was removed was a single woman, L. R., aged 40. She was admitted into the Chelsea Hospital for Women on June 23, 1911, under the care of Dr. Inglis Parsons. Four months before admission she began to suffer from abdominal pains, chiefly in the iliac fossæ, and also from discharge. The pain began a week before menstruation and continued during that

¹ *Trans. Obstet. Soc. Lond.* (1904), 1905, xlvii, p. 138.

time and for a week after. She was free from pain for one week only every month. The discharge was blood-stained and sometimes offensive. Menstruation regular; the loss was more than normal and lasted from six to eight days.

On examination the uterus was found to be enlarged by a hard lobulated tumour and extending above the pubes for 3 in. The cervix was drawn up and pushed over to the left side and enlarged by a smooth rounded tumour, the size of a tangerine orange.

On June 29 the abdomen was opened in the usual way and the uterus removed by panhysterectomy. The wound healed by first intention. The patient made an uninterrupted recovery, and left the hospital on July 19, 1911.

She came up for examination on October 20, and was found to be in good health, with no signs of recurrence.

PATHOLOGICAL REPORT BY MR. BRYDEN GLENDING.

The specimen consists of a uterus laid open and an ovary detached. The uterus is complete and shows externally three small pedunculated subperitoneal fibromyomata. Occupying the region of the cervix and apparently dilating the canal is a spherical mass, the size of a tangerine orange. On section this mass presents a pale centre which gives place to a bright pink zone, and outside this latter is the thinned tissue of the cervical canal. The growth is granular on section and readily lacerated. The walls of the uterus are somewhat thickened; occupying in part the cavity of the uterus is a soft, nodular, roughly papillary overgrowth of the endometrium. Sections were taken in the region of the cervix and in the body. They agree in showing a columnar cell adenocarcinoma. Intervening between the growth are strands of mature fibro-muscular tissue. In the body the growth penetrates to a slight extent into the uterine wall.

Dr. INGLIS PARSONS said that he thought there was no doubt that the carcinoma had commenced inside the cervix, because the whole of that portion of the uterus was occupied by it, except the external surface, whereas in the body of the uterus there was only a small line of growth, which was evidently an extension from the main portion.

Ovarian Cystoma of unusual size complicated by Ventral Hernia and Ascites.

By H. MACNAUGHTON-JONES, M.D.

I READ this brief note of an ovarian cystoma of unusual size as it was the largest growth of its kind I have ever seen. Possibly some of those present will have dealt with larger, and on patients of still more advanced age.

I was indebted to Dr. Dowling Prendergast, of Hanley, for the opportunity of seeing the patient, and for this short history of her condition antecedent to operation: "Age, 67; married, no children. First noticed a swelling in the abdomen twelve years ago. Has been under his care for eleven years." (I may here interpolate that the patient determinedly refused to take the advice repeatedly given to submit to operation.) "Has worn an abdominal belt for some years for ventral hernia, and for some four years since this latter increased in size and became very prominent. Her general health was fairly good; the bowels kept regular. The immediate cause of her submission to an operation was the huge size of the abdominal swelling, which prevented all attempt at locomotion." The walls over the umbilical hernia were thinned to such an extent (Dr. Prendergast says in his report) that he feared rupture of the abdominal wall.

The condition of the patient immediately before operation when I first saw her in her own house—for she could not be removed—was not an inviting one, and I dreaded even her transference into an adjacent room prepared for the operation. She was under the influence of scopolamine-morphia, which had been administered on the previous night and again that morning, while an injection of strychnine and atropine had been given an hour before. The anæsthetic, chloroform, was most skilfully administered by Mr. A. P. Square. The girth of the abdomen in the prone position, by careful measurement, at its greatest circumference was $58\frac{1}{2}$ in. The abdominal muscles for a considerable extent had separated, and the wall was thinned out with a diffused rupture which included an area of some inches in circumference above the umbilicus. The peritoneum was firmly attached in front to the sac of the cyst and both, for some extent, were adherent to the abdominal wall. In detaching the peritoneum before puncture from the wall of the sac a

64 Macnaughton-Jones: *Necrotic Fibroma of the Ovary*

quantity of ascitic fluid escaped. Dreading the effect on the anæsthesia through the sudden relief of pressure, the abdominal wall at either side was held well up, and the remaining ascitic fluid very slowly drained off. The rest of the operation was simple. The huge cyst was emptied and removed, and the patient was in a good condition when placed in bed.

The operation was performed on April 21, and on May 3 Dr. Prendergast reported her as "full of life and spirits," and a fortnight afterwards she was in her garden daily. On October 27 (last Friday) he saw her "well and able to do her shopping."

Necrotic Fibroma of the Ovary, and Cancer of the Cervix Uteri, occurring in the same Patient.

By H. MACNAUGHTON-JONES, M.D.

THE patient from whom the specimen was removed was a married woman, aged 56. She had had three children. The catamenia ceased at the commencement of her fifty-second year. For two years previous to the date of her operation she had been losing blood on and off, using as many as seventy or more diapers in a week. Believing that the loss was due to a change of life she did not have advice. At times of late there had been an offensive discharge, and for a considerable period micturition had been frequent. She never complained of any pain. A week before her operation she was attacked by severe hæmorrhage, for which he (Dr. Macnaughton-Jones) was consulted. On examination, extensive malignant degeneration of the cervix was found, with some invasion of the vaginal roof at one side. There was also an associated tumour which he believed at the time to be a myoma of the fundus. The patient's general condition was very serious from the long-continued hæmorrhages, as also from the urinary complication, which proved to be an old-standing cystitis attended by incontinence.

The case appeared to him to be an operable one, an opinion in which Dr. Herman, who saw her with him in consultation, concurred.

At operation, the diseased portio was curetted away and the exposed surface freely cauterized. A suspicious nodule in the vaginal wall was removed. On opening the abdomen, a solid tumour about the size of

a coconut was found projecting free in the cavity. This proved to be the ovary, which is exhibited with the uterus. Hysterectomy was completed. No glands could be found anywhere.

The only post-operative complication was the bladder trouble, which ultimately yielded to treatment. So far the patient has done well. The interesting point in the case is the associated necrotic fibroid of the ovary. Dr. Cuthbert Lockyer's report is as follows:—

"Macroscopical: The two specimens sent for examination are as follows: (1) The uterus with right appendages attached; (2) the left ovary with corresponding appendages. The uterus measures 4 in. in the vertical, $2\frac{1}{2}$ in. from cornu to cornu. The right appendages appear quite normal; the left appendages have been removed, a short stump of the tube being still attached to the uterus. The walls, cavity, and mucous membrane of the body appear quite normal, but the cervix is infected throughout the whole of its extent by a cancerous growth which appears to have started at the junction of the cervical canal with the squamous epithelium surrounding the os. The uppermost limit of the growth extends nearly to the internal os. The cancerous area measures in the vertical 2 in., whilst the wall of the cervix measures $\frac{3}{4}$ in. in thickness. The surface of the cancer projects for $\frac{1}{2}$ in. beyond the smooth vaginal epithelium; it has a rounded edge, and protrudes through the os as a smooth mushroom-like growth. The exposed area of the growth has been cauterized. A long section cut tangentially to the cervical canal has been removed for microscopic examination. The left appendages are thickened, the tube is swollen, the ovarian ligament hypertrophied. Attached to the latter there is a considerable area of puckered unaltered stroma, and from the outer pole of this hangs a large solid growth measuring $12\frac{1}{2}$ in. in circumference. On section this growth has the appearance of an ovarian fibroma, its lower three-fourths are degenerated, and the lower fourth of the degenerated area has become cystic from mucoid softening. The cystic area is also hæmorrhagic. The outer surface of the growth is smooth, but shows here and there filmy adhesions, and to the lowest pole a small amount of omentum is still adherent.

"Histological: The vaginal scrapings show the structure of an adenocarcinoma in which the columnar gland tissue is well demonstrated, although in places the epithelium is destroyed by desquamation, and is reduced to mere débris. The cervix uteri (from which a large section has been prepared) is infiltrated by an adenocarcinoma which has ramified into the entire thickness of the muscle and extends nearly

as high as the internal os. This growth has arisen from the intra-cervical glands.

"The ovarian growth is a fibroma which has undergone extensive necrosis, and which contains free hæmorrhages and altered blood pigment."

Pyelonephritis of Pregnancy with Specimen of the Urinary Organs.

By HERBERT WILLIAMSON, M.B., and J. BARRIS, F.R.C.S.

CLINICAL HISTORY: I. H., a primigravida, aged 19, was admitted to St. Bartholomew's Hospital on June 20, 1911, complaining of "pain in the right side." No history could be obtained of any renal affection previous to the present illness. Menstrual periods were regular until about the end of November, 1910, when the patient became pregnant. Since that time there had been no hæmorrhage of any kind. She was in good health until June 14, 1911, when she was suddenly seized with vomiting and acute pain in the right loin. Previous to this attack there had been no severe constipation and no diarrhoea; the diet had consisted largely of tinned foods. From this time until her admission to hospital the pain and vomiting continued.

The following note was made shortly after her admission: The patient looks ill but is not anæmic; temperature 102° F.; pulse-rate 120. The tongue is furred and brown. The breasts show signs of activity, and clear secretion can be expressed. Rising out of the pelvis to 1½ in. above the level of the umbilicus is an elastic tumour like the pregnant uterus, foetal parts can be felt, but the foetal heart cannot be heard. The uterine obliquity is towards the right, but its degree is not greater than usual. A tender resistance can be felt in the situation of the right kidney, and a similar resistance, but not so tender, in the region of the left kidney. There is no tenderness over the bladder and the patient has not suffered from frequency of micturition.

Examination of urine: The quantity passed varies from 30 oz. to 48 oz. per diem. It is acid, of specific gravity 1010, contains no sugar, but albumin and pus are present. The centrifugalized deposit shows the presence of a few pus corpuscles and epithelial cells, no casts are seen. A Gram-negative coliform bacillus is present in large quantities.

Bacteriological examination: A pure culture of a Gram-negative bacillus was obtained. The bio-chemical reactions of the bacillus are as follows:—

Glucose ...	...	...	+	Neutral red ...	+
Saccharose ...	...	...	—	Milk ...	+, but no clot.
Lactose ...	...	...	—	Indol ...	—
Dulcitol ...	...	...	—	Gelatine ...	+, but no liquefaction.
Adonite ..	...	...	—

The organism is therefore the *Bacillus paratyphosus*.

Examination of feces: No *Bacillus paratyphosus* was found.

Examination of blood: Leucocyte count—6,800 per cubic millimetre. Blood culture—no growth. The patient's serum agglutinates a culture of the bacillus rapidly in dilutions of 1—20, 1—40, 1—80, and 1—160.

Course of the illness subsequent to admission: The patient was treated by rest in bed and a milk diet. She was given large quantities of barley water, 10 gr. of urotropine and 20 gr. of potassium citrate three times daily. After two days of this treatment her condition improved rapidly, vomiting ceased, the temperature became normal and the urine free from pus, though she still complained of pain in the left renal region, and on account of this a physician was asked to examine the chest. He did so, and reported that no abnormal physical signs could be detected. On July 2, after the temperature had been normal for six days, the ureters were catheterized under anæsthesia with a view to ascertaining the condition of the renal pelves. The bladder was washed out with sterile water and a cystoscope passed. The vesical mucous membrane appeared natural. Gum elastic ureteral catheters were then attached, but the right one only could be passed along the ureter. A specimen was then obtained and collected in three test-tubes, the first two of which were discarded. The urine was colourless, contained no pus, but on culture a coliform bacillus, with the reactions already described, was found. After the examination the patient's colour became blue, the respiration became frequent, the temperature rose to 100° F., and twelve hours later she died.

POST-MORTEM EXAMINATION.

(1) The right lung weighed 27½ oz., the left 24 oz. Both were engorged and œdematous. About half a pint of slightly blood-stained fluid was found in the left pleural cavity. The presence of this fluid

was unsuspected, and as contamination had occurred before it was discovered no cultures were taken.

(2) The heart appeared quite healthy.

(3) The uterus and contents: The uterus contained a foetus within its amniotic sac. Cultures taken from the liquor amnii grew only a few colonies of staphylococci. The placenta was friable, but otherwise natural. The foetus was apparently of about twenty-four weeks' development and was macerated. It presented no other abnormalities.

Cultures taken from the child's blood were sterile, and sections from the placenta failed to show the presence of micro-organisms.

We show to-night the urinary organs:—

Bladder: The bladder appears natural. Its cavity is neither dilated nor contracted, and before hardening was capable of containing 10 oz. of fluid. The wall is neither atrophied nor thickened, the mucous membrane is pale. A microscopical section taken through a fold of the bladder wall shows slight small-celled infiltration, but no evidence of an acute cystitis. The fibro-muscular wall appears natural.

The right ureter below the brim of the pelvis is of natural size for a distance of 4 in.; above the brim of the pelvis it is dilated to the size of a No. 10 catheter, the boundary between the dilated and undilated portions is abrupt and distinct. This fact was verified before the parts had been disturbed. The wall of the dilated portion is reddened and swollen. A microscopical section taken from the dilated portion shows that in some parts the epithelium is shed whilst in others it consists of a double row of flattened cells. The submucous tissue is densely infiltrated with round inflammatory cells, the vessels are dilated, and in some spots hæmorrhages have occurred into the tissues.

The left ureter is dilated throughout its entire length to the size of a No. 15 catheter; the wall is thickened and reddened. When opened the lumen contained purulent fluid, from which pure cultures of the *Bacillus paratyphosus* were obtained. A microscopical section shows that the epithelium is in parts shed and where it persists is flattened. There is less small-celled infiltration than in the section from the right ureter, but the blood-vessels are more dilated and form conspicuous objects in the section. In one or two places are blood extravasations.

The right kidney is pale, soft, and of normal size. The capsule stripped readily. On section the pelvis is a little dilated and its mucous membrane is injected. Two small abscess cavities are seen in the cortex, each the size of a pea, one situated near the upper the other near the

lower pole. These cavities contained necrotic material from which a pure culture of the *Bacillus paratyphosus* was obtained. A microscopical section taken from the cortex near the upper pole shows that excepting in the neighbourhood of the abscess cavities there is very little evidence of small-celled infiltration. In many parts of the section the tubules appear normal, but in some places the epithelium lining them is degenerate and has undergone cloudy swelling, whilst the inner edge of the cells is ill defined, and the lumina contain cellular débris. The blood-vessels are everywhere dilated and engorged, and in many places, particularly in the neighbourhood of the collecting tubules, hæmorrhages have occurred into both the interstitial tissue and the tube lumina. Hæmorrhage has also occurred in some of the glomeruli, but otherwise they appear natural. A microscopical section of the abscess wall from the lower pole of the right kidney shows in its peripheral part lesions similar to those already described, the lining wall of the cavity is formed of degenerate tubules surrounded by dense small-celled infiltration and by granulation tissue in which are many plasma cells.

The left kidney is pale, soft, and slightly larger than the normal, the capsule stripped readily. On section the pelvis is dilated, and contained in the recent state about 1 oz. of purulent fluid. The mucosa is deeply injected. An abscess the size of a pea is situated in the cortex near the upper pole; from the contents of this abscess cavity a pure culture of the *Bacillus paratyphosus* was obtained. A microscopical section from this kidney shows lesions similar to those described in the right kidney, but the interstitial hæmorrhage is greater in amount, and the degenerative changes of the tubular epithelium are more marked.

We show this specimen to-night because it presents several points of interest. We have recently had occasion to inquire into the anatomical lesions found in cases of pyelonephritis of pregnancy, and a careful search through the literature has shown that the post-mortem appearances have been fully described in very few cases only. We offer this description of the specimen as a contribution to the knowledge of the subject.

In the second place, we wish to draw attention to the infecting organism. Although in the majority of recorded cases the organism belongs to the coli group it is not invariably the *Bacillus coli communis*. Thus, out of eleven cases admitted into St. Bartholmew's Hospital within the last two years, three only gave the bio-chemical reactions

of the classical *Bacillus coli communis*. In the case here recorded the organism was the *Bacillus paratyphosus*. As far as we are aware no instance of infection with this bacillus has been reported in pyelonephritis of pregnancy. The organism was recovered in pure culture from the bladder and from the right ureter by catheterization during life, from the pelves of both kidneys after death, and from the abscess cavities in both kidneys, but was not obtained from the feces or from the patient's blood. It was readily agglutinated by the patient's serum.

A third point of interest lies in the condition of the ureters. The dilatation of the right ureter can be easily explained by the mechanical theory, in that the obliquity of the uterus was to the right and the dilatation of the ureter was limited to that portion situated above the brim of the pelvis. The left ureter, however, was dilated throughout its whole length, and the dilatation cannot therefore be attributed to compression between the gravid uterus and the pelvic bones.

Lastly, we would raise the question of the route of infection in this case. In our opinion the evidence points to an infection by the blood-stream rather than by the ascending route from the bladder.

Throughout the course of the pregnancy there were no symptoms of cystitis, and post mortem the bladder showed no evidence of inflammation. Further, the distribution of the abscesses scattered through the renal cortex points to a blood infection; and finally, though we regret that we are unable to offer bacteriological evidence on this point, it is probable that the pleural effusion may have been due to the presence of the same organism.

DISCUSSION.

The PRESIDENT (Dr. Amand Routh) thought this a most valuable contribution to our knowledge of the pyelonephritis of pregnancy. It showed, as many such cases do, that the ureteral dilatation was not due to the pressure or the parturient uterus. The presence of the *Bacillus paratyphosus* in the renal tissues had been clearly demonstrated. It was a pity that the authors could not prove their theory that the renal infection had been via the blood-stream, by the discovery of the bacillus in the blood or tissues. He hoped other observers would place on record such cases, especially if able to bring forward such complete clinical and bacteriological data.

Dr. BLACKER was very much interested in this case because quite recently he had had under observation two cases of pyelitis in which the *Bacillus paratyphosus* has been isolated. The patients had had Wertheim's operation

for cancer performed upon them by his colleague Dr. Herbert Spencer and had come under his care during the vacation. They presented an interesting contrast, for while one of them was very ill and had severe symptoms, the other, although on several occasions the temperature went up to 103° F. or 104° F., always expressed herself as feeling quite well, and indeed, apart from the fever presented no other symptoms. This had been his experience in other cases of pyelitis, both following Wertheim's operation, of which it was a comparatively common accompaniment, and also in association with pregnancy. He thought that catheterization of the ureters should be avoided in these cases, and was accustomed to regard this operation as not without danger and seldom necessary for treatment. The dilatation of the ureter was difficult to explain on the hypothesis that any part of the child or uterus compressed the ureter at the brim of the pelvis; in many of the cases the exact point at which the ureter was compressed was not stated with sufficient accuracy to enable any definite conclusions to be drawn. He would like to know exactly where the right ureter was compressed in this case. The dilatation of the left ureter was no doubt to be explained by a valve-like action at its entrance into the bladder, secondary to œdema and swelling of its wall; while he was of opinion that in most cases the dilatation was secondary to a partial strangulation of one or both ureters, at the point some 1½ in. to 2 in. from the bladder, where they entered the fibrous canal at the base of the broad ligament, a canal which was much better marked in some women than in others, and in this anatomical fact he thought possibly lay the explanation of the apparently capricious manner in which the pyelitis of the pregnancy occurred. He gathered that the authors had not had time to try vaccine treatment before the death of the patient occurred. His experience of such treatment in these cases was unsatisfactory, and he was not convinced that it really had much influence. It was difficult, however, to come to a correct conclusion, since most of such cases recovered, even without any treatment, as soon as the pregnancy was over. He thought that if the bacteriological examination was carried out sufficiently fully other varieties of the *Bacillus coli* would be found to be present in such cases not uncommonly.

Dr. WILLIAMSON, in reply, said that at the autopsy, before the parts had been in any way disturbed, careful observations and measurements had been made to determine the site of obstruction of the right ureter. The junction of the dilated and undilated portions was at the brim of the pelvis and 4 in. above the opening of the ureter into the bladder. In this case it most certainly did not correspond with any fibrous canal in which the ureter might be encased in its course through the pelvic cellular tissue. Nor could the dilatation of the left ureter be explained by such an hypothesis, for it was dilated throughout its whole length up to its entrance into the bladder wall. He admitted the mechanical theory was unsatisfactory and inadequate, but Dr. Blacker was mistaken in supposing that it attributed the obstruction to compression of the ureter between the foetal head and the brim of the pelvis. Pyelonephritis was

most common during the fifth and sixth months of pregnancy, at a time when the head was not large enough to cause any compression, and the condition had never been seriously attributed to such a cause, but to compression between the brim of the pelvis and the enlarged uterus: this view was supported by the condition of the right ureter in the specimen shown to-night; it totally failed, however, to explain the dilatation of the left ureter. A vaccine had been prepared, but it was not used in this case, as during the two or three days required for its preparation the patient's condition improved so markedly. At St. Bartholomew's Hospital, Dr. Williamson had used autogenous vaccines as a routine treatment in all cases of pyelonephritis admitted this year, but he was not prepared to give a definite opinion as to their value until he had treated a similar series of cases without their use. Dr. Blacker had condemned catheterization of the ureters as a useless and dangerous practice, but he did not state what experience he had had of the treatment or wherein the dangers lay. There was no doubt whatever of the value of the method in diagnosis and of the marked improvement in the condition of the patient when a collection of pus pent up in the renal pelvis was evacuated by this means. Mr. Barris had catheterized the ureters in twenty-one cases, sometimes with marked benefit to the patient. The death in this case was not to be attributed to the catheterization, but to the condition of infection as evidenced by the cortical abscesses in the kidney and the pleural effusion.

Full-term Extra-uterine Gestation. Laparotomy during Spurious Labour. Recovery of Mother with Living Child.

By T. COPELAND SAVAGE, F.R.C.S.

(Introduced by HERBERT R. SPENCER, M.D.)

MRS. W. M., of Raupo, New Zealand, aged 27, primipara (patient of Dr. H. O. Jones, of Auckland, New Zealand). The patient, whose home was in the "back-blocks," came to Auckland at the end of May, 1910, with a view to being confined in an Auckland maternity home.

On June 6 she had a good deal of pain, and thinking that labour, which was about due, had commenced, she sent for Dr. Jones, who, finding little evidence that labour had commenced, sent her to a private maternity home to await developments. Throughout June 7 intermittent pains troubled her a good deal, and she slept but little, yet the character and severity of the pains were not such as to make the nurse send for the doctor. On June 8 pains were more frequent and

more severe; but she did not seem to be actually entering into true labour, and as she was getting worn out with the pain and loss of sleep, Dr. Jones was sent for at 5 p.m. On examining *per vaginam* he found the cervix drawn up under the pubes and a rounded mass, the size of a fist, filling Douglas's pouch and pushing downwards the posterior vaginal vault.

I saw her at 6 p.m. on June 8. Rhythmical abdominal contractions could be felt and seen; also foetal movements, and the foetal heart was audible. On palpation of the hypogastrium one got the sensation that the foetus was farther than usual from the examining hand, above and to the right of the umbilicus the feet were very clearly palpable, and in the left iliac region the head appeared to be just under the rather thin abdominal wall, so clearly could it be palpated. *Per vaginam* the os was very high up and close under the pubes, and the one striking sign was that the cervix and lower segment of the uterus were but slightly softened, and, though a little enlarged, were *not shortened or expanded* at all. Behind the cervix, and pushing down in the posterior fornix, was a rounded mass which one made out to be the shoulder and arm of the foetus, obviously so close to the examining finger that it could not be inside the uterus. A malleable metal sound passed into the uterus with an upward slightly forward curve for $9\frac{1}{2}$ in., showing that the uterus had enlarged and been drawn upwards towards the umbilicus in the progress of pregnancy. Pulse 100; temperature 99.4° F.; respiration 24.

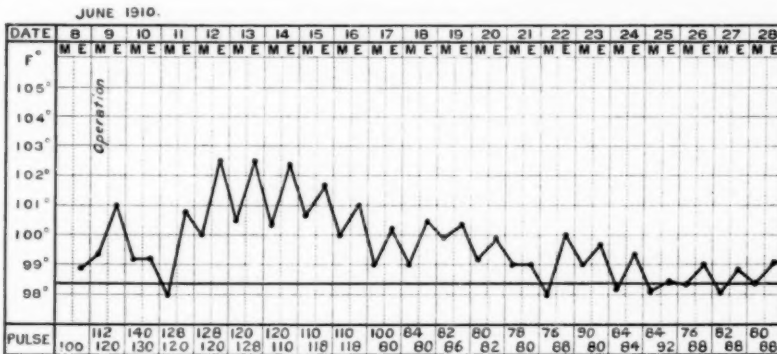
The patient had been married eighteen months; early in January she had consulted a lady doctor on account of severe abdominal pains and intermittent menorrhagia of three weeks' duration, coming on after three months of amenorrhœa. She was told she had had a miscarriage, and needed curetting, and was sent to a nursing home, and examined under chloroform; next day she was told that she had a tumour and displacement of the womb, and could never have any children. Whether she was actually curetted I am unable to say, but she remained in the nursing home some two weeks after the examination. In March she began to be aware of foetal movements, and this, together with the progressive enlargement of her abdomen, led her to consult another doctor, who examined the abdomen only, and estimated her at some five and a half to six months pregnant.

She was very anxious to have a living child, if possible, so I sent her that evening (June 8) to a surgical home, gave morphia to ensure her getting some sleep, and operated at 10 a.m. next day (June 9), Dr. Jones

assisting me; Dr. Goldstein, anæsthetist, and Dr. Robertson and Dr. Endletsberger being present.

Operation: Tight elastic tourniquets were applied as high up as possible on each thigh to retain the blood in the limbs, an incision was then made from a point $1\frac{1}{2}$ in. above the pubic symphysis to a point $2\frac{1}{2}$ in. above and to the left of the umbilicus. The anterior parietal peritoneum was but slightly adherent to the abdominal contents, and the long incision enabled me to palpate and control the abdominal aorta above the fetal mass. The enlarged and expanded uterus reached the level of the umbilicus, and it, with the enlarged broad ligaments, covered rather more than half the mass; in the upper part the transverse colon and great omentum were spread out over the tumour, the lower margin of the omentum being adherent to the upper margin of the uterus and broad ligaments. The placenta could be palpated through the omentum, and was obviously forming the anterior part of the fetal sac, and obtaining its chief blood supply from the omental vessels, which were enormously dilated. Dr. Jones now compressed the aorta, whilst as rapidly as possible I freed the upper margins of the broad ligaments, and double-ligatured the ovarian artery on each side. The large vessels in the omentum were next ligatured about $\frac{3}{4}$ in. from the margin of the uterus, and the omentum separated from the margins of the uterus and broad ligaments, so as to display a small area of the placenta and fetal sac. The placenta was in front, and covered in its upper two-fifths by omentum, and in its lower three-fifths by the expanded uterus and right broad ligament; beneath the left broad ligament an area of amnion free from placenta was exposed. The fingers of the left hand were pushed through this, and the head of the child (which was situate in the left lumbo-iliac region) grasped firmly with the left hand, two fingers of the right were slipped beneath the head over the left side of the pelvic brim, and easily disengaged the shoulder from the pelvis, making delivery of the child quite easy. The cord was doubly clamped and cut, and the child handed to Dr. Robertson. The placenta was then grasped with the right hand on its fetal surface, twisted round, and as much as possible of it rapidly extracted. Bleeding at this time was furious and most alarming, but ceased when the cavity was rapidly plugged with gauze pads. Pressure on the aorta was now relaxed, and all obvious bleeding points rapidly clamped and ligatured. The aperture in the fetal sac, made in the extraction of the child and placenta, was diminished by suture to an opening 2 in. in length, the edges of which were sutured to the parietal

peritoneum at the centre of the wound; the wound above and below this aperture was closed with a tier suture of formalized catgut, and fine silk for the skin. The plugs were then removed, and the cavity repacked with two 6-yard rolls of sterilized gauze (ordinary 6-yard rolls of Macfarlane gauze, viz., 1 yard wide folded to 6 in. and 6 yards long). By this time (about sixty-five minutes) the shock and loss of blood had told heavily; the tourniquets were released, and the lower limbs tightly bandaged from the feet to the groin, a pint of saline with 10 minims of adrenalin injected into the rectum, and the patient put to bed with the foot of the bed well raised. Subcutaneous saline was now administered under each breast and into each thigh, and she soon rallied.



Temperature chart of case of full-term extra-uterine gestation.

Convalescence was fairly rapid and quite satisfactory. On the second day all the gauze was removed easily, with no pain and no bleeding, and two drainage-tubes of $\frac{3}{4}$ -in. diameter inserted side by side to allow for the discharge of serum and lochia. These tubes were emptied by aspiration every four hours. On this day also the pseudo-membranes were passed from the uterus *per vaginam* and came away with the douche fluid. After a few days the discharge from the tubes exhibited the characteristic odour of lochia and small portions of placenta began to come away, so the cavity was irrigated with saline twice daily. On the tenth day the skin stitches were removed and all the wound except the drainage aperture had healed by first intention. On the fourteenth day the discharge became very offensive and the cavity was irrigated with hydrogen peroxide followed by saline. The discharge continued offensive until the

twenty-eighth day, when several large pieces of necrotic placenta were removed with forceps, after which the odour disappeared and the cavity rapidly contracted; the wound was quite healed on the fortieth day and she left the nursing home well at the end of seven weeks.

The baby weighed 4 lb. 10 oz. at birth, was a fully developed male, and healthy with the exception of a slight torticollis (due, I think, to the pressure of the pelvic brim on the neck, the head having been in the left iliac fossa and the shoulder in Douglas's pouch), and a moderate degree of talipes equino-varus of the right foot. When first delivered Dr. Robertson had to apply artificial respiration to encourage it to breathe. Half an hour later it again ceased to breathe, but thanks to the care of Dr. Endletsberger who passed a No. 8 Jacques's catheter through the glottis and sucked out the mucus, soon recovered and gave no further trouble on this score.

For the first ten days the feeding of the child was a matter of great anxiety; it had to be fed artificially and seemed incapable of taking more than $1\frac{1}{2}$ dr. at a feed. On the eighteenth day it weighed 4 lb. 8 oz., and was put on a mixture of peptonized milk (diluted) and cream, 2 dr. every two hours, the quantity being increased gradually as the child was able to take more. From its development at birth I estimate that the child was not less than eight and a half months' foetation, and the mother's estimate is that she was less than ten days from due term.

Seen by me on March 20, 1911, the mother was in good health and the wound perfectly firm and strong. There was no sign of ventral hernia, and menstruation has been regular and normal for four months.

The child on March 20 weighed 22 lb., was perfectly healthy, wry-neck unnoticeable, and talipes, which has been well cared for by the mother, much less marked. The deformity was corrected and the foot put up in plaster.

I heard from New Zealand in July, 1911, that the child remains very healthy and well.

DISCUSSION.

The PRESIDENT (Dr. Amand Routh) congratulated the author upon this brilliant case, so admirably diagnosed and treated. Operations to deliver women at full term in cases of abdominal gestation were rare, and the fact that both mother and child were saved makes this case from one of our most distant Colonies still more remarkable, and worthy to become widely known through the medium of the Royal Society of Medicine.

Dr. ROBERTS asked if any further information could be obtained as to the relation of the sac in which the fœtus and placenta were contained. The case reported was certainly a very rare one, and it was important to determine the exact anatomy of such full-term extra-uterine gestations, especially as operation had been attended with the recovery of the mother and child. In the author's paper Dr. Roberts had failed to follow the description of the situation of the placenta and whether the uterus was normal (though enlarged) at the time of operation. Dr. Roberts had operated on a full-term ectopic case, but in this the child had been dead nearly five months. The sac in which it was contained was clearly demonstrated to be an imperforate uterine cornu. The mother recovered. As regards the survival of a healthy child, as in the case reported by Dr. Savage, it was certainly contrary to what was usually taught, as such children were hitherto supposed to be often unsatisfactory and not worth saving. The difficulty in getting the child to revive in Dr. Savage's case *after* it had been removed from the abdominal cavity was of special interest to Dr. Roberts, as he had met with very similar conditions in Cæsarean section babies; they seemed well at first and then relapsed into a condition of white asphyxia from which it was difficult sometimes to arouse them. Dr. Roberts attributed this condition to shock.

Dr. EDEN said he had operated upon one case of advanced extra-uterine gestation, but this differed from the case which had just been read, for the gestation sac was intra-ligamentary not intra-peritoneal, and the fœtus was dead and the contents of the sac were infected. He removed the placenta and did not find much difficulty in controlling hæmorrhage. He thought that recent experience of this operation had shown that immediate removal of the placenta was usually practicable when the child was dead: comparatively few cases came under observation while the child was living, but quite a number of such instances had now been recorded in which immediate removal of the placenta had also been successfully carried out. Diagnosis, especially in intra-ligamentary cases, was often difficult; one such case had been sent into Queen Charlotte's Hospital as a case of placenta prævia, and he had failed to recognize the condition on the first examination.

Dr. ARTHUR GILES said that Dr. Savage's paper was one of great interest. One of the most striking points was the fact that the operation was done while the child was alive: it used to be taught that such an operation with the placental circulation still active was apt to be one of the most formidable in surgery owing to the risk of hæmorrhage, and he thought that Dr. Savage was to be congratulated on his successful performance. He had come across two cases of extra-uterine pregnancy at full term; the first was when he was house physician at the General Lying-in Hospital. The patient was admitted, supposed to be in labour; on examination the cervix was dilated, and it was an easy matter to get a finger into the uterus, when it was ascertained that the uterus was small and empty. The patient was transferred to St. Thomas's Hospital, where Dr. Cullingworth operated. The second case was reported to the Obstetrical Society of London in 1905.¹ It was like Dr. Eden's, a case of intra-ligamentary pregnancy, but when he saw the patient shortly after the time of spurious labour the child was alive, and he deliberately waited a month till the child was dead: this was on the ground that the extra-uterine child was usually an unsatisfactory subject with a very short expectation of life, and it was therefore thought advisable to consult the extra safety of the mother by waiting. In this case there was a point of some interest in relation to diagnosis, namely, that the whole of the front of the abdomen was resonant; in a normal pregnancy the gravid uterus was the most anterior thing in the abdomen, and consequently the whole abdomen was dull to percussion. He had not seen this point referred to in other reports of cases, but it seemed to him that resonance over the abdomen would always give rise to the suspicion that the pregnancy was not in the uterus.

¹ *Trans. Obstet. Soc. Lond.*, 1905 (1906), xlvii, pp. 114-119.

Rare Books from Professor Klein (Munich).

DR. MACNAUGHTON-JONES presented facsimile copies of three rare medical works sent by Professor Gustav Klein, of Munich. In doing so he referred to Professor Klein's collection of ancient medical literature as possibly one of the most extensive in Europe, and gave the following description of the books now given to the Society. Professor Klein had kindly sent duplicates of the copies unbound.

- (I) DAS BUCH DER CIRURGIA (The Book of Surgery), by Hieronymus Brunschwig. *Published in the year 1497.*

This is the oldest text-book on surgery published in the German language. The text and illustrations are equally valuable; the latter generally represent clinical instruction in surgery, a teacher and two pupils by the bedside. Brunschwig describes the ligature of vessels fifty years before Ambroise Paré, and his statement that "cleanliness is essential for the healing of wounds" suggests an idea of antiseptis.

- (II) DAS FRAUENBUCHKEIN (The Woman's Little Book), by Ortolof von Bayerland.

One of the oldest books on obstetrics and gynæcology. It presents a very good idea of the states of these sciences during the fifteenth century. It deals with the dietary of pregnancy and the management of childbirth, giving the following advice on the choice of a midwife: "Procure a nurse who has not too many words, as childbirth needs work not words."

- (III) ROSENGARTEN (The Rose Garden), by Eucharius Rosslin. *Published in the year 1513.*

This is the oldest printed book for midwives. It is chiefly interesting on account of the illustrations having been taken or modified from classical sources, especially from Soranos of Ephesos and Muscio. As these authors lived about 100 A.D., and as Rosslin's illustrations constantly served as models until about 1700 A.D., it is a remarkable instance of the continuity of science. I may apply to this sequence in literature

Professor Murray's statement in regard to Greek epic: "The history of (obstetric) literature is after all a great and intelligible continuum, not one shining prehistoric island, then centuries of darkness, and then all the rest." Rosslin's son published a Latin edition of this book under the title "*De Partu Hominis*," and Richard Jonas translated it into English from this source in 1540, publishing it under the title of "*The Byrth of Mankynde*."

The PRESIDENT proposed from the chair to send a vote of thanks to Professor Klein, of Munich, for his generous gift, and to express the Section's cordial appreciation of the historical and literary value of these beautifully executed reproductions of otherwise inaccessible books.

Mr. P. P. COLE exhibited a specimen of broad ligament cyst of supposed Müllerian origin, and the description was illustrated by microphotographs.

Obstetrical and Gynæcological Section.

November 21, 1911.

Dr. AMAND ROUTH, President of the Section, in the Chair.

JOINT MEETING WITH THE MEDICO-PSYCHOLOGICAL
ASSOCIATION.

Amenorrhœal Insanity.

An Address Introductory to a Discussion on the Subject.

By C. T. EWART, M.D.

THE by-paths along which I intend travelling have not, in many places, a close connexion with the main road, designated amenorrhœal insanity, but my endeavour has been to write an article touching on topics which might be of some interest to those present, and should I have failed I trust you will take into your kindly consideration the *intention*.

Amenorrhœa, or absence of the menstrual discharge, is *primary* when the patient has never menstruated, and *secondary* when it has previously taken place. The primary is divided into "primary permanent" and "primary temporary," but as I do not deal with these conditions there is no necessity to describe them, although it may be mentioned that the former is supposed to be due to interruption of normal embryonic development, and the latter to vascular changes, with deficiency of hæmoglobin (Halliday Croom).

In the olden days Medicine came to look upon the uterus not only as an organ of reproduction but also as an organ of excretion,

whose function was to eliminate the injurious products of metabolism, hence the old designation of what we call menstruation was "purgation."

Hysteria and neurasthenia are important complications in amenorrhoea, and many forms of skin eruptions accompany the suppression of menstruation. Dr. Jones has reported a case in which menstruation was suddenly suppressed by a chill, and this condition lasted for five months, but in each of these months the patient had for thirty-six hours an abundant flow of milk from the breasts. In some people with ulcers a vicarious menstruation takes place each month from the raw surface. These symptoms most certainly seem to point to some potent retained material, which is capable of causing profound changes in the system, and they are merely mentioned to show that throughout all time there has been a consensus of opinion that the menstrual fluid contains noxious materials, although perhaps not to the extent stated; and it is reasonable to suppose that should there be suppression, the circulation will become contaminated and act injuriously on various parts of the body. We obtain the same toxic effect when the urine is suppressed, and the disease osteomalacia is supposed to be due to some disordered function of the ovaries. The importance of the secretions derived from the thyroid, thymus, the pituitary, and the adrenals, &c., is admitted, and may not the excess, the diminution, or the disordered conditions of these secretions be due to some "life-urge," which acts as a controlling and dominating force, to which the others are but servants?

This periodic flux exists in all races, and in the higher apes, when they are not in captivity, the flow is said to be quite as copious as in women. The curious resemblance to the lunar cycle was long ago noticed, and more recently Darwin suggested that creatures living near low- or high-water mark would have had their nutrition profoundly modified by their position, and the cycles they passed through would lead to a general tendency to periodicity, and the connexion between the physiological periodicity, then impressed on the organism, has survived until the present day. The non-appearance of any corresponding periodic cycle in men is a less difficulty, when we remember that men have a greater tendency than women to vary from primitive conditions. When we consider the marvels of Nature this suggestion of Darwin's does not appear so very extraordinary. More marvellous is the weaving of that simple-looking thing termed a cocoon, by those children of the sun, the butterflies, during a phase of their fourfold

existence. English horses have not been hunted by lions for thousands of years, yet, if to-day you were to "bed" them on the straw used by the lions at the Zoological Gardens they would show the utmost terror. This proves how indelibly Nature can stamp, and how readily a stimulus can revive, an ancestral memory which has lain dormant for a vast period of time.

According to Michelet, women are but "natural invalids," as they have only intervals of health in the course of a continual disease. "Woman is for ever suffering," he says, "from the cicatrization of an interior wound," and for fifteen days out of twenty-eight woman is invalided. At any rate, while a man may be said to live on a plane, the woman lives on the upward or downward slope of a curve, and this is a fact of the very first importance in the study of physiological and psychological phenomena in women. Unless we always bear this in mind we cannot attain to any true knowledge of the physical or mental life of women (Havelock Ellis). All sorts of slight visceral affections may be due to menstruation or the lack of it, and these may recur periodically, whilst on the mental side the irritability or depression may be so pronounced as to amount to insanity. Whenever a woman commits a deed of violence it is extremely probable that she is at her monthly period. Lombroso found that out of eighty women arrested for assault, seventy-one were menstruating; Krugelsstein states that in all the cases (107) of suicide among women he had met with, the act was committed during this period. Women in prison are apt to exhibit periodic outbursts of unmotivated and apparently uncontrollable violence, and among the insane the fact is universally recognized that during the monthly period the insane impulses become more marked. These facts of morbid psychology emphasize the fact that even in the healthiest woman a worm gnaws periodically at the roots of reason.

Thus the regular and normal performance of the usual functions of the uterus and ovaries is of the highest importance to the mental soundness of the female. Disturbed menstruation is a constant danger to the mental stability of some women, nay, the occurrence of absolutely normal menstruation is attended with great risk in unstable brains, and the actual outbreak of mental disease is often coincident with the menstrual period. The difficulty is to know whether the suspended menstruation is "cause" or "effect." Personally I believe it may be both, but the great diagnostic point is, that whereas in most of the varieties of insanity, acute or chronic, the occurrence of

menstruation is apt to cause an aggravation of the morbid mental symptoms, in "amenorrhœal insanity" the appearance of the catamenia means that convalescence has commenced.

Of all phases of human life with which physiology deals, none are more instructive than those of its critical periods. During puberty and adolescence, when the procreative faculties are being unfolded; during the decay and obsolescence of these faculties at the menopause, and, lastly, the final retrogression of senility—the physiological changes are fraught with profound pathological interest. The excitomotor exaltation of the nervous system during the first dentition has its parallel in the explosive condition of the nervous centres of cerebral activity during the evolution of the generative functions, and this period is especially prone to call into being any dormant inherited disease, either as convulsive affections of the motor apparatus, such as chorea and epilepsy, or the physical anomalies of the hysteric type, which is the form of insanity mainly existing at this time of life. The broad view as to the production of insanity appears to be this: The brain, like every other organ of the body, for the performance of its functions requires the perfect condition of its organization, and freedom from all pathological states whatever. Consequently, the existence of any pathological state in the organ of the mind changes its healthy functions, and produces a greater or less amount of disease of the mind—that is, insanity. Even the most sane of us are at times on the borderland of insanity. We have all probably suffered from an attack of the "blues," which is really simple melancholia, but luckily for those who possess a good heredity, a purge or active exercise quickly gets rid of the auto-intoxication, due to the retention of some toxin in our system. Unfortunately, those who are cursed with a pronounced psychopathic predisposition are, under similar circumstances, hurled into the abyss of insanity. The advanced opinion of the present day, not of necessity the most correct, regards toxic action as the most important co-efficient in the production of insanity. According to this view, insanity is not a primary disease but secondary, and due to toxins derived elsewhere acting upon the nerve-cells, disordering their metabolism, and thus affecting their functional activity. The older school holds that mental disease is a primary disease, and that physical manifestations of ill-health result from a disordered central nervous system. Kraepelin maintains that mania and melancholia are so closely related to one another that they are probably different manifestations of the same underlying disease process. They are both alike

in being primarily disorders of the emotions, though the two conditions, so far as their symptoms are concerned, are the very antithesis of one another. They are, however, not more unlike than some of the phenomena of epilepsy are to one another, and these are now universally held to be equivalent manifestations of the same epileptic process. It is held that centripetal nervous impressions come from all the organs and tissues of the body, and although we may be unconscious of these individually, yet these impressions are the basis of our feelings of well or ill-being, and they form the background of our consciousness; hence deleterious material, however produced, can manifest itself either as an inhibitory or excitatory emotion—the two great divisions of Wundt—thus producing melancholia or mania, and it has also been pointed out that when we suffer from an emotion, nervous energy overflows into the intellectual areas, and stimulates those thoughts which are in harmony with it, so that a special train of thought on a certain subject is developed, the result of which is that thoughts on this subject are never absent from the patient's mind, and these may in time crystallize into delusions (Robertson).

In amenorrhœal insanity, what probably occurs is an "auto-intoxication," due either to a decrease or increase of some internal secretion. The sexual instinct is one of those most deeply implanted in all forms of life, but when the testes and ovaries are removed early sexual desire is abolished and no secondary sexual characters—hair, spurs, feathers, hackles, and horns—are developed. In experiments performed by Shattock¹ it has been shown that if small portions of the ovaries or testes of castrated animals are transplanted to any part of the body, altogether disconnected with the ordinary nerve supply, "secondary characters" come into being. If an internal secretion has the power to so profoundly alter the physical appearance, surely it is not unreasonable to argue that excess or diminution might easily produce amenorrhœal insanity in those with an hereditary predisposition. Excess or diminution of the thyroid secretion produces diseases of very different types; the poison of syphilis may cause general paralysis or tabes; alcohol with certain persons, in small quantities, will develop insanity should there be an inherited predisposition; whereas in others, continuous large doses may cause cirrhosis of the liver, but rarely insanity, provided these come of a stock with a stable nervous organization. There cannot be a doubt that every tissue—like a chain—has

¹ *Trans. Path. Soc. Lond.*, 1905, lvi, pp. 57-80.

its special breaking point, and whether this is high or low depends upon your ancestry. When we consider that the brain is a mechanism of marvellous complexity we can well imagine the great variety of clinical forms arising from pathogenic agents which injure more one than another of the cerebral organs, and this fact also corresponds to the predominance of certain psychic components, which give to the structure of each personality the stamp of individual character, and thus the same toxin may produce very different forms of psychoses. The chemical structure of the various elements is less resisting, and shows a greater affinity for the toxic substance, when there is hereditary predisposition. Alcoholic intoxication may produce exhilaration in one person, sullenness or weeping in another, and thus, in all cases, the individual factor has to be reckoned with.

In the homes of the poor we find the dire consequence of disease, of unemployment, of overwork, and nervous strain, of dark, unventilated and overcrowded rooms, of under-nourishment, exposure, of poisoned food, and of ignorance. Roughly speaking, insanity and criminality tend to go together and reach a maximum in the restless industrious centres. They follow in the wake of progress, and they are well-marked signs of the tension of civilization, and they are both on the increase amongst women. It is the tax the sex pays for the privilege of standing beside men, and this apart from the fact that as child-bearers women are already handicapped. What should never be forgotten is that the prophylaxis of degeneracy in the offspring means the prevention of nervous exhaustion in the parents, for the neuroses of the parents become the psychoses in the descendants.

Before the appearance of puberty there is very little insanity, and it is then due to some arrest of development, idiocy, cretinism, &c., but there is a rapid rise at puberty, taking place in girls chiefly. During mature life men are more liable, but at the period of the climacteric women again increase, while in old age there is little sexual difference. It is among the poorer class, exposed to unfavourable conditions of life, that we find the worst cases of amenorrhœal insanity; and this is not to be wondered at when we consider that 42,774 children under 14 years of age were employed in factories and workshops as "half-timers"; 77,376 between the ages of 13 and 14 were employed as "full-timers," and 239,125 who were 14 and under 16 years of age were employed in factories and workshops. I take the following revelations as to the condition of girl workers in factories from the 1910 report of the Chief Inspector of Factories. "The *usual* distressing cases were encountered

in girls working fourteen or fifteen hours a day, the only intervals being for meals, and occasional walks to and from the factory, to fetch work, in order to earn a pittance for themselves and for their families. Sometimes these girls are so feeble that they have to pay someone to fetch their work, and they complain that a great waste of time is occasioned by waiting about for it to be given out." As has been well said, the "strenuous life" is mere moonshine, and is another term for "lunatic asylum." "Hustle, hustle," may allow a company to declare a 20 per cent. dividend, but it steadily works for degeneracy.

Treatment of amenorrhœal insanity should consist of rest in the open air, nutritious food, iron, arsenic, saline, purgatives, Turkish baths, and massage. The main feature is to build up the general health, leaving Nature to do the rest, although I hold strongly that the profuse sweating in the Turkish baths tends to get rid of whatever toxic material may be present, and that they are most valuable means of treatment. I have had seven years' experience of them at Colney Hatch Asylum, and quite recently they have been introduced at Claybury. After the patient has improved, occupation and exercise, especially Swedish drill and dancing, are most advantageous, as these give harmonious and legitimate emotional expressions to the neuro-muscular irritability, which might otherwise escape in more explosive forms. What is the main factor which causes an asylum to show a recovery-rate of 40 per cent.? It is the environmental. It is the transference of the patient from surroundings which have produced a mental breakdown into one differentiated by its relaxation, its occupation, its good food, its good air, its general atmosphere of happiness, its life of tinted colours and not of grey and leaden hues. It is the kindly interest, the individual attention, the substitution of healthy suggestions for morbid ones—a Samaritan psychology—which lead to mental re-education and recovery.

Mankind resembles a great co-operative society, and this being so, we are each fortunately given an apparatus capable of receiving and transmitting messages of sympathy—a link of gold in the chain of life—a power competent to revivify dormant tracts of thought; the lowering of boats in response to signals of distress; the cheerful word of greeting between two ships as they sail across that ocean, along which they do but pass once. Whatever good which may have accrued from "psycho-analysis" is, in my opinion, due to this power, which is no new creation, as it has always permeated the atmosphere of the asylum world where it is known as "moral" treatment, representing in most cases a

conflict between an "auto-" and an "hetero-suggestion," success or failure depending not only on the amount of damage present in the "receiving" machine, but also on the sympathetic "attuning" of the "transmitter."

Given two men, each with equally inherited tendencies to insanity, the one situated in a suitable environment would retain his mental health, the other would not, therefore heredity and environment produce insanity, but environment restores with one hand that which she has stolen with the other.

I have taken fifty cases from the case-books for four years, 1907-1910 inclusive, and I would here express my thanks to Dr. Jones for his kind permission to use these cases. No selection has been made, but I have excluded imbeciles and epileptics. The list represents single girls who have had no children. The ages are from 15 to 25 years, and they are cases of secondary amenorrhœa. The fifty patients will endeavour to produce offspring; some with the sanction of the Church, and then their identity will be lost; others without that sanction, but the ultimate domicile of the two classes will be the same—an asylum.

STATISTICAL TABLE.

The leading features afforded by these cases are :—

- (1) The large percentage showing a markedly hereditary predisposition (82 per cent.).
- (2) The great number quickly recovering after menstruation returned.
- (3) That whatever the type of insanity, it was always of an acute character.
- (4) That mental affections of different clinical aspects may be generated by the same cause, and this is due to the individuality of the patient.

The twelve cases in the heredity division, which did not recover, I looked upon as non-amenorrhœal in type, otherwise they should have recovered by this time.

The nine cases with no history may be due to heredity or not, but as I am unable to determine, they need not be taken into account. Four cases are put down as doubtful heredity, but believing as I do in the "transmutation of disease"—i.e., that an alcoholic may have an epileptic child, a tuberculous parent may have a child with Pott's disease, convulsions in one generation may be represented in the next by hysteria, a neuropath may have a psychopathic descendant—these cases may be included in the heredity division.

Three of the fifty patients have relapsed and returned this year—one pregnant, and the other two in consequence of their menstruation having ceased. Summary of the fifty cases, all having menstruated:—

INSANE.

Heredity Cases, 37.

25 recovered	...	...	...	= 68 per cent.
12 not recovered	...	...	...	= 32 "

Doubtful Heredity Cases, 4.

All recovered	...	...	...	= 100 "
Overwork: Paternal grandfather and uncle consumptive.				
Sudden shock: Father and paternal uncle consumptive.				
Anæmia: Two aunts died of cancer.				
Anæmia: Mother and sister died of consumption.				

No Statement Cases, 9.

7 recovered	...	...	...	= 78 per cent.
2 not recovered	...	...	...	= 22 "

The conclusions I venture to submit to you are:—

(1) That there is a form of insanity which is definitely due to suppression of the menses. It is the cause of the insanity.

(2) It can be recognized by the patient recovering within three months of the establishment of the menstrual flow. This point is so important that we refrain from discharging young cases, who have apparently recovered, until the menstrual function is firmly re-established, for, unless this be the case, we know from experience that they will quickly relapse. It is of course possible that in cases of amenorrhœa which do not recover the cause may be the same, but the lesion irreparable; still, one has to differentiate between the two types.

(3) That in every case there is an hereditary history of some disease which gives to the patient an unstable nervous system, peculiarly susceptible to some toxin, and this the suppression of menstruation throws into the circulation. It is unfortunate that all we know about the chemistry of animal tissues is based upon the chemical combinations that are found in dead bodies and in the catabolic products. The chemistry of life itself is still an absolute riddle for the solution of which we possess only doubtful hypotheses, and before such an audience of experts I but venture to suggest that in the fluid of the Graafian follicle and in the ovum itself lie hidden the secret of amenorrhœal insanity. When this follicle is ripe it bulges, and on pricking it a fluid spurts out and is received into the Fallopian tube, which thus acts the part of a drainage-tube. It is possible that this fluid may not only facilitate the passage

of the ovum, but also be the power which advises the uterus of the coming of a welcome guest. In amenorrhœa there is no ripening and bursting of a Graafian follicle, but the ovum and fluid are absorbed as they are in childhood, and this being in excess of the physiological requirements, the whole organism becomes saturated, insanity appears, and the term "mental amenorrhœics" may be applied to these cases. A similar sequence of events may be seen in the "mental alcoholics." I am theorizing to some extent, but, after all, in science one has to play an intellectual game, with invisible counters. Who has ever had demonstrated the frictionless ether, atoms, corpuscles, electrons, ids, idants, or determinants? What has to be done is to observe facts, fit in a theory, thus creating a workable hypothesis, which can either be accepted or rejected. If this plan is pursued you have something instead of nothing, and something is better than nothing. The picture I am endeavouring to represent is that of a Triune Majesty—the individual, the Graafian follicle and the ovum—intertwined and indissoluble, and without the combination of this trinity in unity, human beings would promptly cease to exist.

It has been suggested that the corpus luteum yields an internal secretion, the effect of which is either to produce fixation of the fertilized ovum in the uterus, or to assist gestation in some other, at present, unknown way. What we do know is, that the corpus luteum gradually disappears in menstruation, but if pregnancy supervenes it becomes larger and more persistent. According to Fränkel the corpus luteum is itself a gland, renewed every month, and he believes that the ovulation cycles are not synchronous, but that ovulation precedes menstruation by about fourteen days, and that the due formation of the corpus luteum is necessary for the establishment of the menstrual flow. Skene holds that defective development of the ovaries is of importance as a cause of mental weakness and insanity. I quote the following from the writings of Griffith and Williamson: "Corpora lutea are found in the ovary between the ages of puberty and the menopause only, although from birth onwards ova are continually ripening and disappearing. What becomes of these ova? Stevens points out that the ovary possesses two functions: (1) The production and maturation of ova; (2) the formation of an internal secretion. Ova are not required before puberty, and the follicles do not rupture, but the ova become absorbed. Fränkel finds, further, that in early pregnancy destruction or removal of the corpus luteum is followed by expulsion of the ovum, whilst removal of portions of ovary, which do not involve the loss of this

body, is followed by no such result." It would thus appear that the life or death of the ovum does not depend on itself, but that a higher power commands it, and this power is the sun, around which the whole organism revolves, and without it the species would promptly be exterminated. But as an individual in health is not conscious of the beatings of her heart, so, in like manner, no healthy woman is morbidly cognisant of the existence of her reproductory organs, and it is only in the event of her higher nervous centres becoming warped—whatever the cause—and losing control of her lower and more animal ones, that in many cases these organs dominate the whole of the mental life, thus causing sexual delusions and perversions. Any form of treatment which tends to divert the patient's thoughts from this portion of the body would, in my opinion, be more likely to do good than one which perpetually focussed her attention on these organs.

I think it will be acknowledged that the highest ideals which Nature has ever before her are the continuation and the improvement of the species. At the same time as the reproductive organs were evolved she probably created a vital force—the secretion of the Graafian follicle—which was endowed with the power of forcing onward the organism to its fullest perfection, and this perfection is represented by the capability of producing mentally and physically healthy offspring. With each species, therefore, the one supreme object is the continuance of itself, and committed to reproduction is the sacred trust of handing on the torch of life, undimmed and glowing with the golden gleam of vigorous well-being. This vital force may well be of the same character as the *élan vital*, the "life-urge" preached by Bergson in his philosophy. Evolutionists have to admit that there must be some power capable of developing an amœba into the supreme intellect of a Shakespeare. This power is ever forcing life upward and onward to some far-off divine event, to which the whole creation seems to move. If in this onward march there is a flaw in the nervous chain the first psychological stress—puberty—snaps it, and should the brain be the organ affected the individual becomes insane, and being young, the type of the insanity is either acute melancholia or acute mania. In the former type the organism has the power of recognizing that it is a disharmonious note in the music of evolution, a blot on the landscape of life, and suicide results; in the latter type the same ending eventually occurs; for mania and melancholia alternate in the same person. But Artificial Selection steps in, and thus it is we now stand and look across vast sunless plains, with polluted rivers pouring their contents into dismal, festering swamps

of destitution, insanity and crime; within their depths the blood-shot eyes of Anarchy—a reproach for the past, and, as we have recently seen, a menace for the future.

The chemical, vegetable, or animal toxæmia exercises as profound a nervous irritation in amenorrhœal insanity as it does in puerperal insanity, and if the latter is considered a nosological entity, I see no reason why the former should not be placed on the same basis. The symptoms are very similar, and if the effete material taken into the blood during the involution of the uterus is capable of producing such mental transformations, cannot it be reasonably argued that the non-excretion of that which should be excreted, occurring at the commencement of the full development of the reproductive process in those peculiarly susceptible—through inheritance—to its action, would cause like symptoms? The whole question is that of the inherited “pre-disposition,” or “immunity,” of the neuron to these toxins.

(4) That there are many cases of insanity in which there is a cessation of the menses, but that these can be recognized by the establishment of the flow, having no effect in curing the insanity.

The recent researches of Bezzola in Switzerland appear to prove that the old belief in the bad quality of children conceived during drunkenness is not without foundation, and he shows that in the wine-growing districts the maximum conception of idiots at the time of vintage is enormous, while it is almost *nil* at other periods. This is a point about which I can obtain most important information from the members of this Society. The questions I would ask are these: What is the amount of damage which alcohol does to the placenta? How much does this poison affect its filtering power? And does the injury cause other poisons, germs, and toxins to more readily cross over into the foetal circulation?

In the problems of heredity we see as yet but as in a glass darkly; but it is being admitted by all that our start in life is no haphazard affair, but is rigorously determined by our parentage. “Grapes do not grow on thorns,” nor “figs on thistles.” Heredity binds one generation to another, and its main law is, “like tends to beget like.” A green frog, if he is not among green leaves, but amid dull, colourless surroundings, ceases to be bright green, and becomes a sombre grey. Put him among foliage, and his green soon returns. If the frog happens to be blind, no change of colour takes place, so that it is by the help of the eye and the nervous system that the change is effected. The true cause of the change is *within*; outer circumstances excite it into operation. Nothing

can arise in an organism unless the predisposition to it is pre-existent. Heredity and environment are absolutely necessary conditions for well-being, and they must be concurrent and co-operate, but it does not follow they are of the same rank, and the final limits of development are prescribed from *within* (Headley). Environment can never create that which does not exist; it can but develop or crush the physical, the mental, and the moral powers which you inherit; it is to heredity what manure is to the plant. Therefore, to improve the conditions in which life is passed, and by which it is moulded, is the smaller part of the problem. The deeper question is, how to maintain and, if possible, improve the innate quality of the race? Attention devoted to both these factors will diminish the number of cases of amenorrhœal insanity.

Is it not possible to account for the decrease of tuberculosis, the increase of cancer, and the non-ability to withstand physiological stress, such as menstruation, to the action of parental age? The former disease is said to mainly affect persons up to the age of 50, and the latter occurs chiefly after that age. Marriages are taking place later in life, and it is held that the effects of age on the germ-plasm are passed on to the offspring. If this is true, it follows that the younger children are older than the elder, and therefore would be more subject to cancer; the elder children would be younger than the others, and therefore more liable to tuberculosis. Owing to late marriages, more children would thus be really older than formerly—hence tuberculosis would decrease and cancer increase. The question of an individual's age possibly does not so much depend upon the years that have passed over his head, but mainly on the condition of his arteries. If, therefore, a man is as old as his arteries, why should not a child be as old as the vigour of the parental germ-plasm? Some men are old at 40, others are young at 60; and there are yet others who, being over 80, are as intellectually agile as those of 30; so that, taking vigour as the criterion, years are of no great value in judging the age of a man. But as a stone rushing down a slope gains increasing momentum, so in like manner the downward physiological path of man increases as years roll on; but just as slopes vary in their acuteness, and the impediments they offer, so do human tissues offer varying impediments in the downward fall which leads to death, and these resistances are inborn. . . . A calculation based upon the almanac would therefore probably not be as correct as one depending on the power of the germ-plasm to create tissues capable . . . of resisting disease; thus the real age of the

younger children should be regarded as being greater than the years they have passed. Since writing the above I have been fortunate enough to discover a valuable contribution by Dr. R. J. Ewart in the *Eugenics Review* of October, and I give some of his conclusions, which are based on statistics. The probability of a child being mentally weak is least—only 0·3 per 1,000—when the age of the parents is between 25 to 30, whilst the chances increase greatly towards both extremes—i.e., 20 and under, and 40 and over—being eight times as great after the fortieth year. "Shortly, we may say that cancer seems to fall more heavily on the younger than on the older members of a family." . . . It would seem that the expectancy of life of those born at the maturity of the parents is about fifty years, and at the extremes about half that figure. It is a point of some interest that after the forty-third year of the mother the expectancy is about twenty-five years, which is scarcely sufficient to bring the offspring into the true reproductive plateau. Now, as the object of reproduction is to reproduce, births in these late years are in a collective sense valueless, and did we depend upon them, the race would be rapidly exterminated."

Rivers¹ states that the conclusion reached by Professor Karl Pearson was that both first and second-born offspring appear subject to consumption at a very much higher rate than younger members of a family. The article also gives the result of Heron's analysis of Urquhart's 331 family trees of lunatic patients showing excess of insanity among the four elder.

The remarkable change in the general appearance of the upper and middle-class girl is mainly due to their health environment, but in the poorer classes girls are becoming smaller and more hollow-chested. Unfortunately, the former—the "fit"—is producing fewer children (3), but increasing the motor-car birth-rate; the latter—the "unfit"—crowded in dens, in the slough of want and battling with hunger, is increasing the size of the family (7), so that it does not require to be a first-class prophet to prophesy the result in a few generations. Can it be that the average physical and mental proportions of a race depend on the size of the female pelvis, which thus acts as a sort of gauge of the race, eliminating those with large bodies and large heads—presumably containing large brains—by killing them at birth? If this is true, the stunted girls of the slums having smaller pelves than the normal,

¹ *Lancet*, 1911, ii, p. 999.

must give birth to children possessing smaller heads, and therefore with a greater tendency to be below the average intelligence of the race. *Prevention* is the only true method whereby insanity can be cured, and by neglecting the laws of inheritance we are slipping down an incline with increasing speed. No discussion on the questions of the causation and treatment of insanity, likely to lead to lasting good, can ever take place unless heredity and environment are carefully considered. What we are looking at is a process of selective degeneration, carried out on an extensive scale by State and private philanthropy. In 1870 we spent one and a half millions on public education, in 1909 we spent twenty-four and a quarter millions; yet crime, pauperism, and destitution have all increased. From the evidence given before the Royal Commission we learn that in England and Wales 271,000 persons are suffering from mental defect, that 130,000 are certified lunatics, and 150,000 are not sane, but are not certifiable, while 66,000 urgently need proper supervision. In the Poor Law institutions 12 to 18 per cent. are mentally defective. One hundred Magdalen Homes sent answers which showed that 14,000 inmates had passed through them, 2,521 of this number were said to be feeble-minded and to have added 1,000 illegitimate children to the population. We know that thousands of feeble-minded girls are constantly giving birth each year to offspring in the different workhouses. Between New Year's Day, 1900, and New Year's Day, 1910, the number of indoor paupers in England and Wales increased from 199,000 to 270,000, outdoor paupers from 503,000 to 539,000, casuals from 72,000 to 93,000. The number of persons tried for indictable offences was for 1899-1903, 55,000, for 1909, 67,000. What is the good of attempting to bale out this great morass with a thimble? Is there no political party capable of seeing that although millions of money are spent no measure of success will ever be achieved if the streams which feed this swamp are not diverted into channels where they can do no harm. The men who beget families in the intervals between attacks of lunacy, and the women who return time after time, each visit following, or in some cases preceding, the birth of an unfortunate child, should be offered the choice of sterilization or segregation—during the sexual life—after two attacks, and before being discharged “Recovered” a third time. But this plan of sterilizing or segregating need not be adopted, if only the meshes of the eugenic net, which is to capture the mentally deficient children, are made small enough to prevent their escape. Therefore, should public opinion decide that these “carriers” of insanity are to

be allowed to produce as many offspring as they desire, it would not much matter; the decision will cost the country more money, more discomfort and anxiety, but the result in two generations will be the same. With the first cast a few descendants may escape, but with the second cast the remainder of the shoal, in the shape of the grandchildren, will be captured. Many married women become insane only when pregnant, and these have no wish to be inmates of an asylum. I have frequently been told that they would willingly submit to an operation—salpingectomy is suggested—and I would like to inquire as to the amount of danger attached to this to prevent this happening, and in the best type of women this feeling can hardly be wondered at, as there is deep distress at the idea that their husbands and homes are being neglected, and, most bitter pang of all, their children nursed by strangers. Frequently the stranger becomes the wife, and on the return of the patient she may discover a strange child in the household; and this is not a source of happiness.

Is insanity transmissible? In the case of disease, what we do inherit is not any particular disease, but a predisposition, and the inheritance exists in the germ-plasm. As every disease requires its appropriate stimulus, the germ-plasm may be represented as a gun, and the stimulus the finger pulling the trigger. Should the gun be loaded, as soon as the trigger is pulled there is an explosion, and the disease manifests itself. Should the gun not be loaded, the trigger can be pulled repeatedly, but no explosion results. The "mental alcoholic" is peculiarly susceptible to the stimulus of alcohol, the "puerperal insanities" to that of some toxin developed during the puerperium; the cases of "amenorrhœal insanity" are victims of some poison not excreted. At one pole is "Predisposition," at the other "Immunity." Stability and non-stability depend on the action of the determinants on the determinates. Maybe many diseases with different names are fundamentally the same—I believe mania and melancholia are the same, their expression changing in response to the conditions of environment, just as a plant changes superficially in fresh soil, or as crystals of the same substance take different forms under different conditions. In the study of heredity the transmutation of diseases is a very important point, and as it affects the subject under discussion I trust you will pardon my touching on the question.

In the "transmutation" hypothesis respecting the "origin of species," it is held that all existing species are the result of the

variation of the pre-existing species, by agencies similar to those which at the present day produce varieties, and that it is probable that all living beings have arisen from a single stock. If there is one result which comes out more clearly than another in geological investigation, it is that the vast series of extinct animals and plants are not divisible, as they were once supposed to be, into distinct groups, separated by sharply marked boundaries. The tendency of modern thought is that a more stupendous evolution has taken place in the inorganic world than in the organic, and instead of many different elements there is but one. If there are "transmutations" of species and metals, why should there not be a "transmutation" of diseases? Through Weismann's theory of Germinal Selection it is possible to believe in this hypothesis. He holds that not only is there a perpetual struggle between the *determinants* derived from the father and the mother, after fertilization has taken place, but that there is as bitter a fight in each germ-cell before fertilization has taken place: that owing to a faulty heredity and oscillations of nutrition, some of these determinants will receive less nourishment, and become weaker, others will obtain more, and get stronger. As the determinants determine the quality of the corresponding part of the body—the *determinate*—this determinate will vary in strength according to the strength of its determinant, therefore, those which have varied in a *minus* direction become weaker, and those varying in a *plus* direction become stronger. It will readily be seen that the union with a second germ-cell, also containing similar tainted determinants, will accentuate the predisposition to any particular disease. The determinants of the nervous system being the most complex and the most recent would be the least stable, and in any competition they would probably, in my opinion, be the first to suffer from nutritional oscillations. If we take two persons of nervous temperaments, the result of two bad matings, and let them marry each other, the majority of the offspring would be neurasthenics; permit the neurasthenics to mate with neurasthenics, you obtain lunatics; these, intermarrying, would produce cases of dementia præcox and high-grade imbeciles; and these, again, would give rise to idiots, sterility, and death of that strain. Weismann's idea that by one set of determinants becoming weaker the others become stronger, may account for the atrophy and hypertrophy of organs, but I do not believe the same thing happens in disease. The greater probability is that heredity having given you a tainted set of determinants, the whole germ-plasm readily becomes enfeebled, and eventually your inheritance is not the predisposition

to any particular disease, but a constitutional peculiarity, which may express itself in many morbid ways, and this it is which causes "transmutations." In viewing three generations of the mentally defective, where there has been close inbreeding, it is very striking to see the gradual increase of physical and mental degeneracy, and this is usually associated with an increased susceptibility to diverse diseases. If Weismann's hypothesis was correct a weakness of the nervous system should connote a greater degree of strength in the other tissues, but such is not the case.

Dr. Mott has drawn attention to the "Law of Anticipation," and this law shows that the offspring of tainted parents develop disease at a much earlier age, and thus the stock tends to die out. Can amenorrhœal insanity be one of Nature's chief lines of entrenchments erected to protect human beings from contamination? Suppose women with hereditary predisposition to insanity to produce children between the ages of 20 to 40, these children would develop the disease between the ages of 10 to 25, and to prevent the contamination of the tainted stock Nature would impress on the organism an inability to reproduce itself, hence the insanity of amenorrhœa from 13 to 25. The symptoms in these cases are acute mania or melancholia—these merge one into the other, and in the latter type the individual will most likely destroy himself, and thus do away with a source of contamination. Civilization, however, steps in, rightly I consider, and that consummation is stayed, which is well, but reproduction is permitted, which is ill.

In conclusion, I submit that those who accept puerperal insanity as an entity must admit that amenorrhœal insanity should occupy a similar position, the cause of each being due to some toxin, and the symptoms present being practically akin.

DISCUSSION.

Dr. ROBERT JONES said that Dr. Ewart had taken the cases which alienists were conversant with, and he (Dr. Jones) thought he could supplement some of the remarks in that paper. He was glad to think that the discussion was the outcome of the most suggestive paper which was read by Dr. Griffith at Claybury, when he inaugurated at Woodford a branch of the British Medical Association. This paper now contributed dealt, in his opinion, with the most fundamental point relating to the race, as well as concerning the individual—i.e., the reproductive functions. The paper was full of suggestions: there was also much philosophy in it, though he feared Dr. Ewart had shown himself to be too much of a pessimist with regard to recoveries in asylums. It was generally agreed that the reproductive function was the highest function of the individual in regard to the race. Darwin wrote about animals in captivity, and showed that animals in the Zoological Gardens suffered first and most in their reproductive system. Birds lived much longer in captivity than in the open air. The animals in the Zoological Gardens were vigorous and healthy, they did not suffer from diseased organs, but they had failures in the reproductive system; presumably, therefore, the nervous system was at fault. It was well known that the advent of menstruation was attended by very distinct and definite psychical conditions, and Dr. Ewart had suggested what might be the explanation of that—namely, an internal chemistry. There must be some change. The internal secretions were, to-day, a great subject of study, and he submitted to the Obstetrical Section that suggestion that those chemical constituents collected in the blood and acted upon what Dr. Ewart said was the fundamental point in his paper—namely, a faulty or a vicious heredity. The author of the paper found that heredity was responsible for 88 per cent. of these cases. Just before this combined meeting, a discussion was held by the Medico-Psychological Association, dealing with heredity in ordinary insanity, in which it was shown that heredity played a part in certainly 50 per cent. of all the cases. It was well known that animals had a special season for propagating their species; this was known also in regard to fishes and birds; man was the only exception. In the human female two points came up clearly: (1) periodicity and (2) liability to be affected by what Dr. Ewart termed environment. It was an interesting fact that some of the nurses who joined the staff at Claybury Asylum—

a large number he would state of the younger ones coming from the country—had suppression of their menses on joining, and for a more or less considerable time afterwards. Food could alter the chemical constitution of the cells. Why did binary fission take place in protozoa? Why did germination occur? There seemed to be some hidden and not yet understood chemical condition. It was well known also that environment would affect plants. The normal growth of them (leaves, branches, flowers) could be so altered as to put off the growth of flowers indefinitely. So the flowers were not as they should be, the proper culmination; environment had to be reckoned with. As long ago as 1824, Jenner pointed out in the *Philosophical Transactions* that at the period of the migration of birds their ovaries increased in size and became more "fleshy." Others had described atrophy in those of the cuckoo in the month of July—that, again, suggesting chemical changes or internal conditions. Others, again, said that migration was due to a certain definite proportion between darkness of day and the amount of food. There were thus two conditions, an internal or chemical cause, and an external or environmental. He considered that the asylum was the very best place in which to study those very refined and subtle changes in mental conditions in consequence of peripheral stimulation; for there one found the neurasthenic and the psychasthenic, who were most wonderful weather-glasses; such a person was a splendid "galvanometer" of what occurred from outside as well as from within. It was known that the exhausted neurone was the most responsive, of course unhealthily responsive, to stimuli. For that reason it seemed quite appropriate that Dr. Ewart's paper should be considered by a joint meeting of a Mental and an Obstetrical Society. The subject was a very complex one, and he would welcome any light which might be shed upon it by the obstetrician. He knew that anæmic girls entered as patients into Claybury suffering from amenorrhœa, and that when the menses had become re-established mental recovery took place. He could make that definite statement. How did they recover? They had Turkish baths, and measures of that kind, with the idea of eliminating toxins. One of his patients, a fairly young woman, attributed her recovery to the Turkish baths. Physical drill was also given, and that was very important. They also had for the anæmia what was more important than phosphorus to the brain, namely, iron. He knew persons who, having been previously healthy, when menstruation was suppressed immediately had an outbreak of mental disease. The final cessation

of menstruation was also another very subtle time, and obstetricians knew quite well that women required very careful and gentle handling to carry them safely over the shoals of the climacteric. He had known people who had consulted him outside as to their physical and mental condition about the period of the climacteric, and who had eventually found themselves under "care" mentally. But, although menstruation might cease and the amenorrhœa might precede insanity, the question arose, was one justified in assuming that there was in these a definite relationship of cause and effect? He asked whether it might not be that the insanity was a correlative of the amenorrhœa, and that both were due either to emotional disturbance or something akin to it, such as a toxin, bringing about some constitutional vice? He would like some light thrown upon that in the discussion. His own view was that there was such a condition as insanity (though not of any special type) occurring in consequence of amenorrhœa. Most often in young girls who came into asylums the menses reappeared simultaneously with the recovery from their mental symptoms. Occasionally, however, recovery from insanity was not followed by the re-establishment of the menses. The converse was also true—recovery from insanity may not always follow the re-appearance of the menses. He regarded the comparative study of this subject as a very important matter. Much wild talk was indulged in about the effect of the woman's condition on the man. Not long ago he met a man who had neuralgic symptoms during his wife's pregnancy, which symptoms were only really relieved at the time of the birth of the child. Sellheim described the undulating line of movement which was characteristic of ordinary normal menstruation, and it seemed clear that the metabolism of the body and the metabolic changes, including an increase in the thyroid, changes in the parotid glands and even in the skin, occurred in sympathy with menstruation. First of all there was an increase in the nitrogen products, and he believed that the output was gradually increased up to the full development of the uterine mucosa. Dr. Westermarck, in his interesting book, went into the history of primitive man concerning the question of the establishment of menstruation, and he found to his satisfaction—and he (Dr. Jones) thought others who had done much reading would agree with him—that originally man was a monæstrous creature; but now man (the genus) was di-æstrous, most births were found to take place about February and September, indicating that the Christmas marriages, a great season among the poor, and the festivals of the May Queen, which latter were survivals of the Spring festivals of ancient

times, were periods of saturnalia, festivals of sexual licence, and were confirmatory of the survivals of interesting events from the anthropological point of view. In ordinary women it was well known that the period of menstruation was one of a not inconsiderable strain, undue sensitiveness, and nervous malaise. He had numerous cases at Claybury Asylum in whom the period of menstruation was known definitely by the occurrence of epileptic seizures, by irritability, and even by delirium; the manifestation might even amount to acute mania every month. The occurrence of the menses was in a distinct mental cycle of its own, and he was very glad to feel that there were present men who could speak, as the Chairman could, with great authority on the subject. Those who had to treat mental disease would be much helped by any information and instruction which the debate might bring forth, as their knowledge in asylums must of necessity be limited, for their mental patients were unwilling inmates. They resented detention, and any attempt at vaginal examination, unless there were obvious necessity, was greatly objected to; indeed, it might be viewed as a serious assault, and become the basis of suspicious and delusional states, which would tend greatly to retard mental recovery. The lesson from Dr. Ewart's valuable paper was that all states of weakness, all circumstances which tended to over-excite the nervous system, and all conditions tending to lower normal inhibition, were converging factors in a suitable soil—i.e., in those with inherited tendencies to mental breakdown, towards the production of insanity. He ventured to congratulate the Society on having such an interesting paper to open the discussion.

Dr. H. MACNAUGHTON-JONES said he ventured to take part in the discussion, appreciating as he did the enormous importance to the woman of the whole question involved in the occurrence of amenorrhœa. He had for a number of years taken a considerable interest in the psychological relationships of the internal genitalia to the affections of women. Possibly that might be because some of his earliest associations were centred around a large lunatic asylum with which, in his younger days, he was connected. In the year 1893 the Gynæcological Society devoted two whole evenings to the subject, and he introduced the discussion. Later on—namely, at the Ipswich meeting of the British Medical Association in 1900—when the subject of the relationship of crime and insanity to sexual troubles in women was brought forward, he again opened the discussion. That was why

he ventured to say a word at the present meeting. He proposed to confine his remarks to the question whether there was sufficient justification to separate out, as a type and class, a form of insanity to which the term "amenorrhœal" might accurately be applied. The profession was to-day in a better position to approach the discussion of the subject than it was a few years ago, because terms could now be more accurately applied to such mental conditions in women, as neurasthenia, psychasthenia, hysteria, melancholia, hypochondria, which were more clearly differentiated. Side by side with more accurate grouping of the particular symptoms associated with each of those conditions there was, as had already been said, a far more accurate knowledge of the whole subject of menstruation, ovulation, the relation of ovulation to metabolism, both that of the ovary itself and of the body generally, and more particularly to the uterine functions, both in the pregnant and the non-pregnant states. And in recent years both homoplastic and heteroplastic transplantations of the ovary had proved beyond all doubt the enormous importance of the ovarian secretion. In addition, owing to our better knowledge of the development of the corpus luteum and the part it played in menstruation and pregnancy, and the whole influence of the lutein secretion, which was administered in certain mental conditions associated with menstruation, the profession was now in a different position in regard to the knowledge of the psychical effects of the ovarian secretion. But he would like strictly to limit himself to the very important point as to whether there was justification for speaking of "amenorrhœal insanity." He held that there was nothing more dangerous than to introduce a term which had not a strictly accurate and scientific basis to justify it. In the medical profession, unfortunately, terms were applied in order to justify certain practices and grounds of practice; and he could conceive of nothing more dangerous than to get into men's heads that a woman suffering from amenorrhœa, whether primary or secondary, who happened to show some curious psychasthenic or neurasthenic symptoms, was necessarily to be classed as an amenorrhœal lunatic. From anything which had been said that afternoon it seemed to him that nearly all the causes which led to amenorrhœa were those which also led to insanity—heredity, anæmia, chlorosis, environment, trauma, shock, mental disappointment. He thought that was the common experience of many present. A woman whose menstruation had been regular became melancholic, and the menses ceased. Menstruation, in that instance, had no relation to the melancholia. Some few years ago there were statistics published

which were taken from several large asylums, and it was shown that among those suffering from dementia, delusional insanity, melancholia, epileptic mania, the number who had simple amenorrhœa was very small. He made this statement with some hesitation in the presence of his psychological listeners. Before accepting such a term as "amenorrhœal insanity" he thought there should be more solid grounds than there appeared to be at present. He had always understood that the organ most affected in insane people was the heart; certainly in a large proportion of cases of insanity the heart was found to be affected. But one would not, on that account, speak of cardiac insanity. No one felt more strongly than he did about the enormous importance of the sexual activities in women and the whole influence of the genitalia, both mentally and physically. It was the strongest link in the chain of a woman's life, and if it were weakened, that weakening would at once affect her whole physical and mental condition. But, while admitting that, he would submit that it was a more or less dangerous innovation to accept and adopt a term which did not at present seem to be scientifically justified.

Dr. R. PERCY SMITH said he was very glad to hear Dr. Macnaughton-Jones's remarks. He remembered, and took part in many years ago, the discussion on the relationship of diseases of the pelvic organs in women to insanity. He also recollected the discussion at Ipswich. He quite agreed with Dr. Macnaughton-Jones that it was a dangerous thing to apply such a term as amenorrhœal insanity. When he saw the title of Dr. Ewart's paper, he thought it was going back to a classification of insanity which had been to a large extent abandoned. He had hoped to hear in the paper some description of what the author meant by amenorrhœal insanity; yet he regretted to say he did not gather the information he desired in that matter. The author did not describe any form of insanity which had a special association with amenorrhœa. But the author said, and all would agree with that, that there might be amenorrhœa with both melancholia and mania. There was often insanity associated with amenorrhœa, but, in his opinion, there was no special amenorrhœal insanity. It must be remembered that amenorrhœa was an extremely common symptom in all the acute insanities of women. One met with it in cases of melancholia, in acute mania, in puerperal cases, and so on. It was very rare in association with the more chronic insanities, the cases of delusional insanity, or early dementia, or chronic

dementia. But one did not meet with amenorrhœa as a necessary symptom. It was exceedingly common in young women who were attacked with what might at first appear to be neurasthenia or psychasthenia, but which developed into definite melancholia. It seemed to him that if there were any form of insanity to which the term amenorrhœal insanity should be applied, it was in the type of case occurring in young women in whom, commonly, there was a history of prolonged fatigue or stress. For instance, one saw it in shop assistants, telegraphists, telephonists, and others following monotonous occupations for long hours, perhaps with insufficient nourishment, and who, in consequence, became anæmic and worn out, who lost flesh and became run down, sleepless, and depressed. Generally it appeared that the amenorrhœa was not the primary condition followed by melancholia, nor was it that melancholia was the primary condition followed by amenorrhœa, but that both had come on concurrently. It was a common observation that the patient recovered when the menstruation was re-established. In many of those cases there was amenorrhœa for six or more months. During that time, in the course of treatment, flesh was put on, sleep was being restored, and the mental condition becoming more normal, though the patient was evidently not quite well yet, and then menstruation recurred as the last evidence of the recovery of the general physical health; after that date the patient again reaching her former level of health. Dr. Ewart had said that the diagnostic point in favour of amenorrhœal insanity was that within three months of the re-establishment of the menses the patient was fit to be discharged. That seemed to say it was difficult to diagnose amenorrhœal insanity until the patient had recovered. But it was desirable, if possible, to diagnose it early in the attack. It was of course a good rule that a patient who had had an attack of mental disorder, of whatever nature, and who had recovered to the point that menstruation had returned and had had two menstrual periods consecutively without relapse, should be regarded as recovered. With regard to the question of treatment, there was one thing which he felt absolutely certain about, namely, that such cases did not need any local treatment. The question was already raised by the relatives of the patient somewhat as follows: "This girl has had amenorrhœa for six months; she has been under care for melancholia, and she seems well on the way to recovery mentally, but her menses have not returned; is there not some local disease? Should not something be done locally?" His answer to that was, unless one felt that there were

definite indications of local pelvic disease, that no case of that sort should be examined. The author had well said that the attention of the patient should not be concentrated on the pelvic functions in these cases. Thus the treatment resolved itself almost entirely into one directed to improvement in the general health. Dr. Jones very properly referred to the fact that iron was found to be the sheet-anchor for the anæmia, and he (Dr. Smith) felt that most of the cases, if they were going to recover menstruation, would do so without any local treatment. But if there was evidence of pelvic disease, it should of course be treated in just the same way as similar disease would be dealt with outside the asylum. He felt, however, that there was no royal road to the cure of amenorrhœa in insanity by any special form of treatment.

Dr. A. W. RUSSELL (Glasgow) said that as a provincial member he would accept the Chairman's invitation to say a word on a point or two which occurred to him while listening to the paper and the speeches which followed. He ranged himself on the side of those who criticized the term. He believed the knowledge available did not yet justify the term "amenorrhœal insanity." But the paper which had been read, even if it did not justify the use of that term, made out a strong case for the study of the subject from the present point of view. His experience had been that when the subjects of amenorrhœa had shown nervous disturbance, the stoppage of the menses had been the effect rather than the cause. He could remember chronic cases of pelvic disorder, where there seemed to be a danger of profound mental disturbance, and where the removal of the ovaries cut short the symptoms which threatened insanity. He recalled also a case, particulars of which he published in Glasgow, which had a profound interest from the point of view of mental disorder. It was a case in which an asylum attendant on duty in an epileptic ward developed epilepsy. Very naturally she was considered as having probably acquired it from the associations of her work. But she was found to have a growth of the ovaries, which had occurred simultaneously with the occurrence of the epilepsy, and he had little doubt that it was the cause of the attacks. Both ovaries were removed, the one having developed into a tumour which weighed about 9 lb., and the other showing marked signs of the same disease. This completely cured her epilepsy. He had asked one or two asylum physicians in Glasgow to come to the Society, and deal with the mental side of pelvic, and especially ovarian, disorders, but they did not seem to think that our knowledge was as yet sufficiently definite. He believed

the condition under discussion bore a marked relation to some toxic condition. One was aware of the influence of toxins on the nervous system. Sometimes the toxæmia was due to food, and he felt that some of the cases of actual insanity in young women were due to a persistent neglect of the proper principles of feeding, and the omission of seeing to a regular relief of the bowels. When admitted into an asylum they were put upon proper treatment, hygienic and other, and the normal and proper functions of the body were soon re-established.

The President of the Medico-Psychological Association, Dr. W. R. Dawson (Dublin), said he did not propose to deal with the subject at any length, the more so because he was sorry—from the point of view of a lively discussion,—to say that he found himself in almost complete accord with nearly all the preceding speakers. He did not believe there was such a condition as amenorrhœal insanity, if by that was meant a special form of insanity produced by amenorrhœa. Amenorrhœa was one of the commonest symptoms in all forms of acute insanity, but it was generally considered that the form in which it was most prevalent was melancholia. He thought that could be explained to some extent on the same basis as the other physical symptoms which accompanied melancholia. Melancholics, for instance, were particularly subject to disorders of digestion, to anæmia, to heart irregularities, and the disorder was also sometimes associated with disease of the kidneys. Probably Dr. Maurice Craig would say that those symptoms were due to the heightened blood-pressure and the contracted arterioles found in such patients. Dr. Ewart, in describing what he called amenorrhœal insanity, mentioned very few pathognomonic indications; indeed, the only one he gave was that the cases got well rapidly. But he mentioned twelve cases of apparent amenorrhœal insanity, and afterwards said they could not have suffered from that condition because they did not get well. That indication could therefore scarcely be accepted. Amenorrhœa might precede the occurrence of insanity, or might follow it; moreover, the menses might return before the insanity was recovered from, or vice versa. That seemed to make it clear that the presence of amenorrhœa in insanity was merely a concurrence or syndrome, and not causal in any way. He quite agreed that the period of the menses affected the mental condition of the patient, but it was just as the same period affected the mental condition of many sane women. He regarded anæmia as the real explanation of the whole matter. Dr. Robert Jones had said that the typical cases of

the condition which came into Claybury Asylum occurred in young anæmic girls, and it was well known that such girls were very liable to various nervous symptoms. If, in addition to anæmia, they had a bad heredity, a neuropathic diathesis, it was not surprising that mental breakdown should occur among them. He believed they must hold that the existence of amenorrhœal insanity as a definite morbid entity was, in the words of their Scotch friends, "Not proven."

Dr. W. S. A. GRIFFITH said the question now being discussed arose out of a paper which he read in another place, and he made the suggestion that it would be better to debate it in such an assembly as this. He had not yet learnt exactly what Dr. Ewart meant by amenorrhœal insanity. Indeed, he did not think it was yet very clear what was meant by amenorrhœa. Possibly there was some misapprehension in regard to this. The discharge which occurred monthly was a mere phenomenon in menstruation, and he gathered that the meeting was discussing the absence of this, which might be a different matter from the absence of menstruation, just as the retention of the menses was different from the entire absence of the menstrual process, which occupies half the month in its inception, completion, and retrograde stages. He thought it would have been better if Dr. Ewart had said exactly what he meant by amenorrhœa. Were they discussing the mere absence of the visible discharge which, in the healthy woman, consisted of two chief constituents, mucus in abundance and a variable quantity of blood? It was known quite well that in some cases of so-called amenorrhœa it was the blood only which was absent. He suggested these points so that on a future occasion it might perhaps be possible to discuss the subject with more precision than seemed possible that day. The meeting would feel greatly indebted to Dr. Ewart for having brought the subject forward. With regard to treatment, Dr. Ewart asked him in what way he would treat amenorrhœa, because in a certain number of cases, if menstruation could be re-established normally the patient stood a better chance of mental recovery. This was a difficult question to answer. No girl who was anæmic ever got well without her bowels being cleared out. This was so important that he put it in the first place. There were many cases of copræmia, or toxæmia, following the absence of this precaution. The administration of iron without clearing the bowels often made the patient worse. After attention to the bowels he placed food, fresh air, and iron as about equally valuable. It must be remembered that the function of

menstruation depended on the ovaries, for if healthy ovaries were removed from a healthy woman she would never menstruate again, though she might bleed; this, however, was a different thing. The ovaries governed mēnstruation, and if a healthy girl did not menstruate for years there was something behind it which neither iron, nor purgatives, nor fresh air, nor exercise, would remedy. What that something was, was not yet known.

Dr. HAYDN BROWN desired to make a few remarks on account of having heard a certain observation made in Dr. Ewart's paper—viz., that anything which served to take the attention of the patient away from the region of the pudenda was of value. Stimulated also by the remarks which he had heard in the discussion, he desired to mention a treatment which was only too little known, but was of vast importance, not only to gynæcologists and psychologists, but to every earnest member of the profession—namely, psycho-therapy. This was not only valuable as a treatment, but it shed a flood of light on the nature of the very conditions now under consideration. He had had unusual opportunities of studying the effects of psycho-therapy in borderland cases, and in connexion with the functional conditions associated with menstruation, and he found psycho-therapy acted like a charm in all functional cases. It was important not only in amenorrhœa, but in dysmenorrhœa and menorrhagia, and in mental conditions associated with the menopause. A good deal had been said about general ill-health in these conditions. It happened that in treating insanity on the one hand, or disorders of the menstrual period on the other, the physician was at the same time attending to the general health; and constipation, anæmia, and dyspepsia themselves yielded to psycho-therapy when it was employed in a proper manner. The question was one to which the profession would need to pay more regard in the future.

Dr. STODDART desired to associate himself with the speakers who denied that there was such a disease as amenorrhœal insanity, believing that the amenorrhœa was simply a concomitant symptom. But he would not like absolutely to close the door on the matter without quoting one case which occurred to him, and seemed to show that there might be an occasional ætiological relationship, though no doubt very rarely. The case he referred to was that of a young lady who was previously in perfect health and had a faultless heredity. In

the summer-time she bathed in the sea, and there seemed to be a definite association between the subsequent amenorrhœa and the insanity which developed with it. The menstruation ceased from the moment of the bathing and, when he saw her three years later, she had not menstruated since. In association with the amenorrhœa she developed a form of insanity, which came into line with dementia præcox; there was the silly laughter followed by dementia. He had not seen her for eighteen months, but he believed she had not yet menstruated. Therefore it seemed possible that this might be a case of insanity dependent upon amenorrhœa. The remarks of Dr. Haydn Brown suggested to him another case for mention in the discussion. It was that of a lady who likewise had not menstruated for three years, and had developed ordinary melancholia. She was unable to continue her work, was depressed, lost interest in life, and came into Bethlem Hospital. She was there now. Within a week he started psycho-analysis. After the second hour he began to penetrate her subconsciousness, and a marvellous result occurred, for she menstruated that night. The menstruation took its normal course, and mental improvement began from that time. So one had to recognize that amenorrhœa *might* cause mental disorder, and, on the other hand, that mentality had a definite effect upon menstruation.

The CHAIRMAN (Dr. Amand Routh), after congratulating the joint meeting on the excellent discussion, said he agreed with previous speakers that insanity had not been proved to be due to the amenorrhœa in cases where the two were associated. Recent researches, however, into the bio-chemical causation of amenorrhœa, and into the possible causation of insanity by auto-toxæmia, made the temptation great to assume that these conditions might sometimes be ætiologically associated. Menstruation was almost certainly due to the gradual cyclical accumulation in the blood of certain chemical bodies, which were perhaps derived from the internal secretion of the ovaries and of the other ductless glands (adrenals, thyroid, pituitary), and Dr. Blair Bell had done much excellent work tending to show that some proportion of these derivatives consisted of salts of calcium. Dr. Bell had also shown that the uterus was homologous to the calcium chamber of birds, and actually excreted large quantities of these lime salts during the first part of the menstrual discharge, which was then largely made up of leucocytes, with the result that there was a marked and immediate lowering

of the calcium blood content. It was evident, therefore, that amenorrhœa might tend to produce a double auto-toxæmia, due on the one hand to the existence of an altered or diminished internal secretion of the ductless glands, including the absence of the primary products of lutein formation, and on the other hand to retention of the substances normally excreted by the uterine glands at menstruation. Pathological chemists had not yet discovered what these toxic substances were, and it had not yet been scientifically proved that they caused insanity. This suggestive paper would lead to careful study of the subject.

Dr. EWART, in reply, said that the period allotted being too short, he had been compelled to abbreviate his paper considerably, and he was afraid an impression of disconnectedness would be conveyed, but he trusted a certain amount of coherence would be seen when the article appeared in print. As to the term "amenorrhœal insanity," he was merely contending that all those who accepted puerperal insanity as a nosological entity would be justified in placing amenorrhœal insanity in a similar position. The cause of each was possibly some form of auto-intoxication, and the symptoms were practically akin. Although both types presented the appearance of physical wreckage, there was no especial anæmia. The mental symptoms were those of acute mania or melancholia of various lights and shades, but before such an audience it would have been merely occupying time to endeavour to paint a picture of conditions about which they were experts, especially as there probably would be no agreement as to the terms he would have used in defining the tints. As to the inability to diagnose a case of amenorrhœal insanity until after improvement—not recovery—had occurred, the same difficulty occurred in those cases called dementia præcox, a term which should, in his opinion, include only a particular type of primary dementia which showed a progressive downward course and from which there was no recovery. He had seen many cases diagnosed as dementia præcox recover, but in the early stages who could truly say "*this* case will recover, and *that* will not?" It might be either a case of dementia præcox from which there was no recovery, or a case of adolescent insanity from which many recovered. Who could tell? He confessed that, until improvement had commenced, he could not. The non-ability to digest milk was frequently hereditary, and this must mean not only some alteration in the constitution of the gastric juice but possibly also a change in the glands themselves; in like manner, a mental alcoholic inherited a peculiar susceptibility to the poison of

alcohol, and a mental amenorrhœic to some toxin derived from the generative organs. These were the appropriate stimuli. Both individuals were potential lunatics, but had no alcohol been taken in the one case, and had menstruation not ceased in the other, neither would have become insane; therefore, as he saw it, the terms alcoholic insanity and amenorrhœal insanity were from the ætiological point of view perfectly justifiable. If there was any good reason for suspecting the development of a peculiar toxin in heart disease, why should there not be a cardiac insanity? His outlook on menstruation had been from the standpoint that the discharge of blood was an outward and visible sign of some inward condition connected with reproduction. He would not detain them any longer, as Time was not sitting with folded wings, so he begged to thank the President and those present for their courteous patience.

Obstetrical and Gynaecological Section.

December 7, 1911.

Dr. AMAND ROUTH, President of the Section, in the Chair.

Cervix (Anterior Lip) adherent to Posterior Vaginal Wall down to Perineum.

By J. P. HEDLEY, M.C.

THE patient was a young married woman who had suffered from bearing-down pains and prolapse since the birth of her first child four years previously. At the confinement the perineum was torn, but was not sutured, and from that time she noticed a projecting lump at the vulva, and was troubled with bearing-down pain. Her second child was born two and a half years later; there was no difficulty in delivery. In June of this year she had a fourth-month miscarriage, which was not complete and caused irregular vaginal bleeding for three months. She was sent to me on account of the bleeding and prolapse.

On inspection of the vulva an extensive old laceration of the perineum was seen, and a projecting ridge from the posterior vaginal wall, which had the appearance of a rectocele. On vaginal examination the projection proved to be an elongated part of the cervix, and was continuous with the anterior and left lips; it was firmly united to the posterior vaginal wall from the perineum up to a point $\frac{1}{2}$ in. below the normal level of the external os; here there was just room for the tip of the index finger to be passed behind it. The os itself was difficult to find at first, but could be felt behind the unattached part of the elongated lips at about its normal distance from the vulva.

Operation (September 20, 1911): I divided the elongated lip at the normal level of the external os, repaired the cervix, and did a posterior colpoperineorrhaphy, and in this way removed the parts of the cervix and vaginal wall together.

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The patient made a good recovery and reports herself free from discomfort.

The specimen is composed of an elongated piece of the cervix with attached pieces of vaginal wall. The upper end is thick and the lower tapers to a point. At the upper end there is a cut surface where the lip was amputated from the cervix, below this there is a zone $\frac{1}{4}$ in. wide, which is completely covered by mucous membrane. The remainder of the specimen is uncovered by mucous membrane on its posterior surface, where several ovula Nabothii can be seen.



Diagram of the vagina and uterus in sagittal section showing the anterior lip of the cervix elongated and adherent to the posterior vaginal wall except in the extreme upper part.

The points about the case that I think interesting are: the great extent of the adhesion, the easy delivery in spite of it, and its close resemblance to prolapse of the vaginal wall.

Mrs. WILLEY said that she had treated a very similar case of adhesion of the cervix to the vaginal outlet. The patient came three months after delivery with a history of difficult labour, complaining of prolapse. The cervix was found to be torn in three directions, and the anterior third of the cervix was elongated into a finger-like process firmly adherent in the scar of the torn perineum. The adherent section of cervix was cut through, and three months later the cervix was repaired.

Primary Carcinoma of the Ovary.

By J. BARRIS, F.R.C.S.

THE specimen appears to be an example of primary solid ovarian carcinoma. Such growths are not common, and many tumours of the ovary described as primary carcinoma have, on more careful examination, proved to be sarcomata. This specimen is shown to-night partly in order to decide upon its nature, and also because it presents in addition several features of unusual interest.

Clinical history: The patient, a single girl, aged 16, was admitted to St. Bartholomew's Hospital on September 8, 1911, under the care of Dr. Williamson, to whom I am indebted for permission to publish the case. Menstruation began at the age of 15, and was regular and normal. The last regular period ended on September 10. She had never been pregnant. Five months previous to her admission she noticed a hard movable swelling about the size of a plum in the lower part of the abdomen on the right side. Her general health remained unaffected, but the swelling grew rapidly and shortly after her admission appeared as a centrally situated solid tumour reaching to the level of the umbilicus.

Dr. Williamson opened the abdomen on September 13, and found a solid growth of the right ovary. There was no free fluid in the peritoneal cavity. The mass was free from adhesions except at its lower pole. The pedicle, composed of the right tube and broad ligament, was transfixed, and the tumour removed. Section of the mass was immediately made, when it was seen to be of malignant nature. In view of the fact that ovarian malignant disease is so often bilateral, the left ovary was subjected to a careful examination, and although to the naked eye it appeared normal in every way as to size, shape, colour, and consistency, it was decided that it should be removed also. No sign of any other primary growth, either in the uterus, the bowel, or the breasts, could be detected. The lymphatic glands in the sacral, lumbar, and mesenteric areas were not palpably enlarged.

The patient made an uninterrupted recovery, and at the present time presents no signs of recurrence or of ill-health.

Pathological Report.—The specimen shown to-night is a portion of the tumour. In the recent state the growth was ovoid in shape, weighed

5 lb., and measured 8 in. in its greatest diameter. It was elastic in consistency. The outer surface was pale in colour, somewhat lobulated, and was free from adhesions except at the lower pole. The cut surface was solid, of a homogeneous, gelatinous appearance, slightly yellow in colour. There were no cystic spaces.

Microscopic section of the mass (right ovary) shows a loose oedematous connective tissue stroma containing many thin-walled blood-vessels. Lying in the meshwork of this stroma are numerous cells somewhat spheroidal in shape, the nuclei of which are large and vary in size and shape. These cells are for the most part arranged in a definite alveolar manner. No egg cells as described by Fothergill are seen.

Microscopic section of the left ovary shows that although to the naked eye it appears healthy, yet in reality very little of the ordinary ovarian stroma can be detected. It is widely infiltrated by masses of spheroidal cells. These are larger than those described in the tumour on the right side, and are spindle-shaped. These cells are not arranged in an alveolar manner, but form definite masses which present a wavy edge, recalling to mind the appearances of a corpus luteum. But many of these cells are not limited by any definite boundary, and can be detected scattered in the ovarian stroma. Both within the remains of the ovarian stroma and in the growth are several small cystic spaces lined by a single layer of epithelium almost cubical in shape. No connexion can be established between these cells and the spindle-shaped cells previously mentioned.

There are several points of interest in the case:—

(1) The growth appeared to be primary in the ovary. At the time of operation a careful search was made, but no other site of primary origin could be detected. The uterus, intestines, and breasts appeared healthy.

(2) A second point of interest arises as to the nature of the growth of the right ovary. That it is malignant there can be no question. It is, in my opinion, a carcinoma. The alveolar arrangement of the cells, and their appearance, exclude sarcoma, although it is true that the cells are somewhat ovoid in shape and approach to the spindle shape. Whether it be an endothelioma is not so easy to decide, but no connexion between the cancer cells and those lining the blood spaces can be demonstrated.

With regard to the growth in the left ovary it is, again in my opinion, a carcinoma. As to the site of origin, two suppositions may be

mentioned. The first is that the small cystic spaces may represent Graafian follicles, and the growth may have arisen from the *membrana granulosa*. In support of this view it is to be noted that these spaces are actually embedded among the masses of cancer cells, and also that Voigt has collected several cases of this nature.¹ But against this supposition is the fact that in some of these cystic spaces definite red blood corpuscles can be seen, and therefore it is possible that they may really be blood-vessels although the epithelium lining them has not the appearances of endothelial cells. The second possibility is an extremely interesting one, and is that the growth may have arisen from a corpus luteum. It has already been mentioned that the edge of the masses of epithelial cells have somewhat the outline of the corpus luteum. Such a mode of origin is not unknown, for Grouzdew² has reported one and collected two other cases of this nature.

(3) The age of the patient is also noteworthy. The great majority of primary ovarian carcinomata have been found to occur between the ages of 40 to 50. This patient was only 16. This is not, however, the earliest known case, for Dr. Eden has kindly told me of a case recorded by Olshausen in a child aged 8. The same remark does not apply to sarcomata of the ovary, which occur often in the young. Mr. Doran has published such a case in a foetus of the seventh month.

(4) The case further shows the importance of removing both ovaries when one of them is definitely the seat of a carcinomatous growth. In this instance the second ovary, although natural on naked-eye examination, was widely infiltrated by malignant growth, so much so that practically nothing of the ovarian stroma remained. Had reliance been placed only on naked-eye examination in this case this malignant mass would have been allowed to remain.

Report of the Pathology Committee.—We have examined the sections of the right ovary submitted by Dr. Barris as carcinoma of the ovary, and we agree with its description as a spheroidal-celled carcinoma. The sections of the left ovary (which were made from a portion only of the ovary) show in their substance a structure which possesses in its general outline the appearance of a corpus luteum. While it is obvious that the structure is abnormal in so far as each of the two portions of ovary examined shows the same structure and an almost entire absence of Graafian follicles, the majority of the Committee are of the opinion

¹ *Archiv. f. Gynäkol.*, Berlin, 1903, lxx, pp. 87-112.

² *Ibid.*, 1903, lxx, pp. 445-61.

that there is not definite evidence of malignancy. Dr. Herbert Williamson and Dr. Barris dissented from this view, and expressed the following opinion: "The ovary contains a structure with the general outline of a corpus luteum. The cells composing this body resemble follicular cells, but show an unusual degree of proliferation, and are atypical in form. In view of the condition of the opposite ovary it is probable that these follicular cells have undergone a malignant change."

DISCUSSION.

The PRESIDENT (Dr. Amand Routh) asked the exact date of the operation, and also whether ascites was present.

Dr. EDEN said that he thought great caution should always be exercised in regarding carcinoma of the ovary as a primary growth. He recollected the case of a young woman, aged 30, from whom he removed a bilateral solid ovarian carcinoma which he regarded as primary. She had at the time no symptoms suggestive of malignant disease in any other abdominal viscus, and nothing abnormal could be detected by palpation at the time of the operation. Yet a few weeks later melæna appeared, and she died within six months; unfortunately, an autopsy could not be obtained, but he had little doubt that a primary malignant growth was present in some part of the intestine, and the ovarian growths were really secondary. He should also like to put in a plea for a more extensive operation in these cases than that described by Dr. Barris. His own practice was to remove the uterus as well as the ovaries, for it had been demonstrated to the Obstetrical Society by Dr. Lockyer, and confirmed by Dr. Glendining and other observers, that metastatic deposits from ovarian cancer were frequently formed in the wall of the tube, and probably they could be traced to the uterus also.

Dr. STEVENS remarked that he concluded Dr. Barris referred to a peculiar histological type of carcinoma. Primary columnar-celled carcinoma of the ovary was common enough, whereas sarcoma of the ovary was not at all frequently seen. Dr. Stevens also suggested that the second ovary mentioned required further examination as the slide exhibited strongly suggested lutein tissue and not a malignant growth.

Dr. CUTHBERT LOCKYER said that in his opinion the section shown of the left ovary presented no signs of malignancy, but it contained a corpus luteum and some disseminated lutein tissue with a certain amount of ovarian stroma; he suggested that, with Dr. Barris's permission, the case be referred to the Pathology Committee.

Dr. MACNAUGHTON-JONES said that he had had several cases of primary malignant disease of one and both ovaries without involvement of the uterus or

the bowel at the time of operation. In one case, one of the largest scirrhus carcinomatous tumours of the ovary on record, some 12 in. in length and 24 in. in circumference, was removed, the other ovary being converted into a solid fibro-adenoma about the size of a fist. There was no other disease present, but the patient, who was reduced to 5 st. in weight at the time of operation, died six months subsequently of cancer of the bowel. In another instance there was adenocarcinoma of both ovaries with the tubes, which were also infected. There was no other disease present in any organ. The uterus was removed with the ovaries. Within a year carcinoma recurred in the bowel. Some fourteen years ago he had removed a very large cystic, semisolid, sarcomatous ovary, and there had never been any subsequent trouble.

Dr. BARRIS, in reply to the President, said that there were no signs of ascites at the time of operation, and that since then the patient had been in good health. There were no symptoms pointing to any intestinal disease. It was, however, only three months since her admission to hospital and therefore the after clinical history was not at present of much value. The uterus and tubes were not removed in this case. In reply to Dr. Eden, he said that there were not, nor had there been, any symptoms suggesting intestinal disease, and further that the type of cell did not suggest a primary source of origin in the alimentary canal. Dr. Stevens must have misunderstood him. He did not say that primary ovarian carcinoma in general was less common than sarcoma, but that solid carcinoma occurred less often in the young than sarcoma, and that many cases regarded as carcinomatous proved on more careful examination to be sarcomatous. With regard to the statement made by Dr. Stevens and Dr. Cuthbert Lockyer, he agreed, and had already pointed out, that the arrangement of the cells in the left ovary did suggest the appearance of a corpus luteum. But if so it must be regarded as abnormal, for the cells were found infiltrating the ovary in other places, and were unlike ordinary lutein cells. He welcomed the suggestion that the specimen should be sent to the Pathology Committee for further report. He agreed with the remarks of several speakers that the uterus and tubes ought also to be removed in such cases. There were several facts to support such a view. Dr. Glendining had recently collected the statistics of thirty-eight such cases, and in twenty-seven of these the growths involved both ovaries, and he further had demonstrated the spread of the cancer cells along the lumen of the Fallopian tube.

Carcinoma of the Vulva in a Patient aged 79.

By H. MACNAUGHTON-JONES, M.D.

THE sections are shown for their pathological interest, and the unusual age at which the disease made its appearance. The growth was removed from the vulva of the patient who was on the border of her eightieth year. It involved the entire labium at one side, and appeared to have commenced about a year previously. The opposite labium was free of disease, and there was no glandular involvement; nor was the vagina or uterus affected. Any extensive radical operation was impossible, the risk even from anaesthesia in consequence of her cardiac condition being considerable. However, the entire growth was removed with practically no loss of blood, deep sutures being carried well under the labium from above down before its ablation. When I saw her six weeks after the operation there was some recurrence of the growth in the region of the meatus and on the opposite labium. Radium was suggested, but she could not consent to any further treatment. When last I heard of her she was suffering no pain, and very little local distress.

Cyst occurring in Resected Ovary.

By H. MACNAUGHTON-JONES, M.D.

THIS cyst, which is about the size of an orange, was removed from a patient aged 35. In January, 1910, the left adnexa were removed, and at the same time the right ovary was resected, only a very small portion of it being left, sufficient to enable menstruation to continue. The condition of the ovaries at the time they were removed is shown by this report of Dr. Cuthbert Lockyer:—

"Both ovaries show evidence of chronic oöphoritis. The cortex is thickened, the few vessels which reach it from the medulla have thickened walls, while those in the central core and at the hilum are likewise thickened, with their walls undergoing hyaline degeneration. There are several lutein cysts present, and many atresic follicles with

epithelial linings. One ovary is void of primordial follicles; in the other they are very scanty."

She remained quite well for some eighteen months after the operation, when she again suffered from pain in the right side. On seeing her in November I was surprised to find a cystic swelling in the right fornix. On operation this was seen to have grown from the remains of the right ovary, the Fallopian tube being healthy. On microscopical examination a small portion of ovarian tissue capped the cyst wall. In these cases of oöphoritis with follicular degeneration, in which both ovaries are involved, such an occurrence shows that we cannot guarantee that even from the smallest portion of ovarian tissue, which may at the time appear microscopically sound, we may not have a future cyst developing.

Dr. WALTER SWAYNE said that he had met with a similar case. The patient was a 1-para, aged 34, at the time of the last operation. In 1906 he removed the whole of the left ovary and resected more than half of the right. At the end of 1907 she became pregnant, and in 1908 was delivered of a full-term child. In 1911 she was found to have a cystic swelling of the right ovary which was removed in September last. The cyst was as large as a hen's egg. There was no trace of the suture material (Pagenstecher's thread) which had been used in suturing the ovary.

Rupture of Pregnant Rudimentary Horn of Bicornute Uterus.

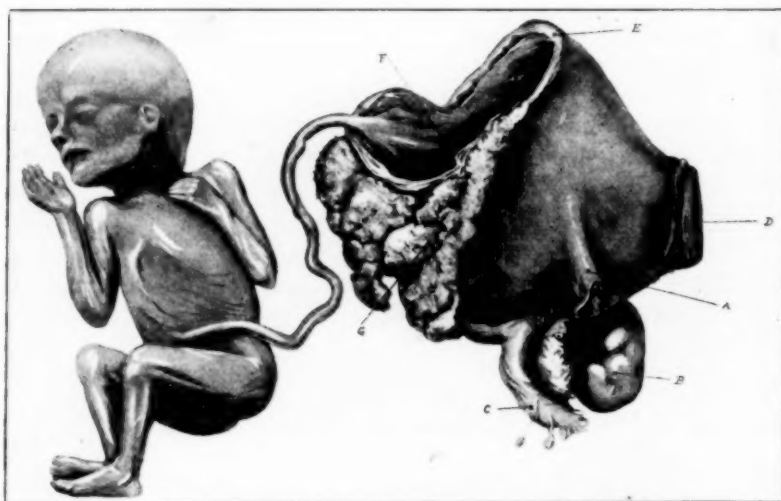
By BECKWITH WHITEHOUSE, M.S.

THE patient from whom the specimen shown was removed was a 3-para, aged 36, first seen in consultation with Dr. Frew, of Small Heath, Birmingham, on November 3, 1911. The previous pregnancies had been normal and the labours quite uncomplicated. The history of the present illness is as follows: After four months' amenorrhœa the patient was seized with acute abdominal pain, associated with vomiting. She did not faint and was able to walk up to her doctor's house. Slight abdominal pain had been present for ten days previously, but not sufficiently severe for her to seek advice. Dr. Frew ordered her to bed, and on examination found the pelvis occupied by a double tumour. He diagnosed a ruptured tubal gestation and asked me to see the case. The abdomen was somewhat tender, slightly

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distended, and a small area of dullness was present in each flank. The general aspect of the patient was excellent. She was not anæmic, and her pulse-rate did not exceed 100. The vaginal examination showed that the uterus was enlarged to about the size of a three months' pregnancy. Adjacent, and apparently attached to the right side, was a very tender elastic tumour, the size of a small coco-nut. There was no uterine hæmorrhage.

A diagnosis was made of pregnancy complicated by ovarian cyst, probably with torsion of the pedicle, and operation was advised.



The figure shows a ruptured four and a half months' gestation in the rudimentary cornu of a uterus bicornis. A, round ligament; B, ovary; C, Fallopian tube; D, section through point of attachment of rudimentary cornu with the remaining uterine horn; E, rupture in wall of cornu through which fœtus escaped into peritoneal cavity; F, amniotic cavity; G, placenta.

The patient was immediately transferred to the General Hospital, Birmingham, and arrived about 10.30 p.m. A half-hourly pulse-rate was taken, and as the rate fell after admission to 80 per minute, it was decided to defer operation until the morning. On opening the abdomen through a right semilunar incision, I found the abdomen filled with dark venous blood and slight hæmorrhage in progress from a rupture on the surface of a rounded, dark red tumour, occupying the right

iliac fossa. The right Fallopian tube and round ligament were traced into the tumour, which consisted of a pregnant uterine cornu. It was connected with a well-developed and hypertrophied left uterus by a short pedicle about 1 in. in length. In delivering the tumour the rupture was increased, but the fœtus had evidently escaped previously, and was found still attached to the placenta in the cornu by the umbilical cord. Hæmorrhage was controlled by clamping the ovario-pelvic ligament and the uterine pedicle, and the pregnant cornu was amputated through the latter.

The patient made an uninterrupted recovery.

Description of the specimen: The specimen consists of a ruptured pregnancy in the rudimentary right horn of a bicornute uterus, the whole weighing 12½ oz. The rupture involves the upper and outer aspect of the cornu, but extends to the anterior surface and exposes a cavity measuring 4 in. by 2½ in. The cornu presents a thick, fleshy pedicle measuring 1½ in. by ¾ in. in diameter, showing the point of attachment to the left uterus. No communication can be traced in the pedicle between the pregnant horn and the rest of the uterus. This has been verified by the microscope. The round ligament is seen directly entering the anterior surface of the tumour, and the unaltered and healthy Fallopian tube lies well to the outer side, entering the cornu at the distal pole. The cavity of the horn is lined by the fetal membranes and placenta. A portion of the latter protrudes through the rupture. Connected with the placenta by an 8-in. umbilical cord is a fœtus 8 in. in length and weighing 4½ oz.

DISCUSSION.

The PRESIDENT (Dr. Amand Routh) drew attention to the frequency with which rupture of the pregnant horn of a bicornute uterus is associated with absence of any communication between the gestation sac and the vagina, requiring external migration of the fertilized ovum to explain the pregnancy.

Dr. BLAIR BELL said that it was not uncommon for pregnancy to continue normally in a well-developed horn of a bicornute uterus. He had performed Cæsarean section at full term for contracted pelvis, and had removed the fœtus from a fully developed horn; the other horn had an equal development, but there was only one cervix (uterus bicornis unicollis). He also remembered another case in which a woman with a uterus bicornis duplex had a large family without difficulty. It was, therefore, only in cases where conception occurred in a *rudimentary* horn that danger was to be anticipated.

Dr. BECKWITH WHITEHOUSE, in reply, agreed with Dr. Blair Bell's remark that difficulties usually arise only when a pregnant cornu is rudimentary. Just recently Dr. Thomas Wilson had had in his ward at the General Hospital, Birmingham, a case of pregnancy in the right horn of a completely septate uterus and vagina, and it was decided to allow the pregnancy to continue to term. Also, Dr. Whitehouse recalled that when a house physician to Dr. Tate he had seen a perfectly normal labour take place in a patient who possessed a uterus bicornis. He believed that this patient had since successfully terminated another pregnancy. The pedicle in his case of rudimentary cornu was narrow, but comparatively broad; in fact, about 1 in. in diameter. The cornu was attached to the left uterus, at about the level of the os internum. This was the usual arrangement in such cases.

Extra-uterine Gestation ; Death of Fœtus near Term ; Removal of whole Sac three months later.

By WALTER TATE, M.D.

L. W., AGED 26, married for thirteen months, was admitted to St. Thomas's Hospital on October 3, 1911. Menstruation was quite regular up to September 24, 1910; the loss on this occasion was less than usual. In January, 1911, she began to be sick after food, and could keep very little down. After vomiting she would feel quite well again, and was not troubled with any discomfort till the next meal was taken. During this same month she had an attack of pain in the back of the neck and lower part of the spine. The pain was sufficiently bad to keep her in bed for four days, after which she was all right. One month later, viz., in February, when she was about five months pregnant, she had a severe attack of pain in the lower part of the abdomen on the right side. This attack necessitated the patient keeping in bed for a week, and on getting up she had some dragging pain down the right leg. In the beginning of May the legs began to swell, and there was a certain amount of swelling of the rest of her body. Fœtal movements were first felt in May. At the beginning of June she began to have a discharge of watery fluid (about half a pint) from the vagina. This continued for a month and then ceased. Fœtal movements ceased to be felt in June. Early in July there was some secretion from the breasts which was noticed for fourteen days; during this time the breasts became smaller, and the abdomen was also noticed to be diminishing in size. Since the end of

July there had been a slight coloured discharge every fourteen days, with a sensation of discomfort as though the period were coming on. The last loss occurred a month ago and was rather more profuse than before. The patient had not observed anything like a membranous cast in the discharge.

Since June the patient's general health had steadily improved. On admission the patient was a healthy-looking woman, not showing any sign of illness or distress. There was a large mass, spherical in shape, and about the size of a seven months' pregnancy, occupying the abdomen and rising out of the pelvis. The mass was elastic and free from tenderness, and felt like the pregnant uterus. On palpation over the left side of the swelling a faint crepitus was felt at times. There was dullness all over the tumour, with resonance in the flanks. The breasts were flaccid, the areola pigmented, and several tubercles seen round the nipple.

On vaginal examination the os uteri was found to be fairly firm, the uterus could not be clearly defined apart from the tumour, but the sound showed the canal to pass upwards and to the right. The cervical canal was dilated and the interior of the uterus explored, before deciding to open the abdomen. It was then found that the uterine cavity was empty, and the uterine canal measured 4 in.

As the case was clearly one of extra-uterine gestation the patient was then placed in the Trendelenburg position, and a vertical incision made from 1 in. above the umbilicus to the pubes. When the peritoneum was divided the tumour was seen to be an extra-uterine gestation sac, and the uterus, very slightly enlarged, could be made out quite separate from the tumour in front and to the right. The left broad ligament could be seen stretched over the anterior and left aspect of the tumour. The omentum and coils of small intestine were adherent over the upper, anterior, and right aspects of the sac. The right appendages were normal; the left ovary could not be identified. The omentum and small intestine were first separated from the anterior and right side of the sac, any bleeding points being secured with ligatures. Next, the uterine end of the broad ligament was clamped, and also the infundibulo-pelvic ligament. The deeper portion of the sac was then gradually shelled out from the floor of the pelvis, and in this situation it had burrowed beneath the peritoneum. Any bleeding points were very readily controlled. During the manipulations the sac ruptured, and a portion of the foetus protruded. There was only a very small quantity of amniotic fluid which escaped at this time. The sac, including foetus and placenta,

was removed entire, and after ligation of several tags of adhesions and portions of omentum, the abdomen was closed without any drainage.

The patient made an uninterrupted recovery and left the hospital at the end of three weeks.

Parts removed: The gestation sac removed measured $24\frac{1}{2}$ in. in circumference, and weighed 5 lb. 2 oz. The actual foetus weighed 4 lb. Stretched over the surface was the left Fallopian tube, the cut surface of which presented a normal appearance. On tracing the tube outwards and backwards over the tumour, the outer end was lost over the outer surface of the sac and the fimbriated end was subsequently found to terminate on the inner aspect of the sac. The anterior and upper surface of the tumour presented a few adhesions where intestines had been separated, and a tag of omentum was also seen, which had been removed with the gestation sac. The lower and left portions of the tumour had been shelled out from the back of the broad ligament and from the floor of the pelvis, where it had burrowed under the peritoneum of Douglas's pouch. This portion also presented a somewhat roughened surface. On opening the sac a little thick, greenish fluid escaped, and a full-term foetus, slightly macerated, was exposed. It was lying doubled up in a flexed position. Dipping into the concavity between the arms and legs was the placenta, from which a somewhat shrivelled cord passed to the umbilicus. The placenta was situated in that part of the sac that corresponded to the outer end of the Fallopian tube. A thin bristle, passed along the tube from the uterine end, entered the sac behind the placental site, suggesting that the placenta developed in that part of the sac which was formed by the expanded outer portion of the tube. The foetus was evidently a full-term one, although its weight was only 4 lb. The head was covered by a good crop of dark hair, the skin was smooth, and did not show the presence of any lanugo. A fair amount of vernix caseosa was present, and the nails reached the tips of the fingers.

DISCUSSION.

The PRESIDENT (Dr. Amand Routh) gave the history of a very similar case brought to his notice by his colleague Dr. Watt Black, described in a book written by Abraham Cypriani, M.D.,¹ published in Leyden in 1700. It describes

¹ Cypriani, Abraham, M.D., "Epistola historiam exhibens foetus humani, post xxi menses ex uteri tuba matre salva ac superstite excisi." Leyden, 1700.

the case of a woman who was operated on by Dr. Cypriani for an abdominal gestation twelve months after full term, the woman recovering. The woman, a 3-para, was aged 32, and had believed she was again pregnant, and at full term had had a spurious labour, with severe pain, but without escape of liquor amnii. During the following months she had much pelvic discomfort and sense of weight, and twelve months afterwards menstruation reappeared and she became weak and ill and took to her bed, and after severe abdominal pain a small opening developed at the umbilicus. Dr. Cypriani enlarged this opening sufficiently to introduce his finger, and was then able to feel a foetal parietal bone. After consultation, on December 17, 1694, he enlarged the opening by incision, and had some difficulty in keeping back the intestines. Dr. Routh presumed, therefore, that the gestation was intraperitoneal and not intraligamentous, though throughout his remarks Dr. Cypriani speaks as if he was dealing with pregnancy in a dilated Fallopian tube. Dr. Cypriani extracted the foetus and with it the cord and placenta, which he states was adherent to the right Fallopian tube. The placenta had become membranous and avascular, and there was no suppuration or offensive material in the cavity, though the opening at the umbilicus showed signs of ulceration. He closed most of the wound with four interrupted sutures of waxed thread, including in each, peritoneum, muscle and integument, leaving the lower end open for drainage. The cavity gradually closed and the woman returned home on March 17, 1695 (*hilariter et paucratice*). It is rather remarkable that in January, 1696 (the following year), she was delivered of a daughter, and in 1697 she had twins, a boy and a girl.

Dr. CUTHBERT LOCKYER recalled another case of spurious labour also seen by Dr. Tate some ten years ago at the Samaritan Hospital, which was operated upon by Mr. Alban Doran. Dr. Tate was able to prove the presence of a post-mature extra-uterine foetation by the presence of crackling of the skull-bones and by his being able to insert his examining finger through the patent cervical canal and high enough to touch the fundus uteri. This proof of an empty uterus was all the more interesting, as in the case Dr. Tate had shown to-night he was unable to distinguish the uterus apart from the abdominal tumour.

Primary Carcinoma of the Female Urethra.

By BECKWITH WHITEHOUSE, M.S.

PRIMARY carcinoma of the female urethra has received but little attention at the hands of British gynaecologists, and the standard text-books are somewhat lacking in information on the condition. Thus, in Allbutt, Playfair, and Eden's "System of Gynaecology" the subject is dismissed with the single remark that "in rare instances sarcoma and carcinoma are met with." Herman, in his "Diseases of Women," devotes eight lines to the question of symptoms and diagnosis, and in Bland-Sutton's "Tumours" I can find but a scanty reference only. Macnaughton-Jones deals with the subject a little more fully, but the most detailed account as far as British text-books are concerned appears in Eden's recently published "Manual of Gynaecology." The case-records for the British Isles are also very few, and I can trace but seven undoubted examples. In 1895, and again in 1901, Mr. Battle excised a female urethra for carcinoma. In the latter year also Professor Kynoch reported a case before the Edinburgh Obstetrical Society. The late Mrs. Stanley Boyd has placed on record in the *Journal of Obstetrics*, 1906, two well-marked examples of the disease. These few cases, together with one reported by Croft before the North of England Gynaecological Society in 1907, and one included in a paper by McGill in 1890, constitute, as far as I can trace, the whole of the literature appertaining to this subject that has appeared up to the present from the pen of British authors.

Abroad, however, a considerable mass of literature has collected, and the subject has been studied by Wassermann, Ehrendorfer, Burckhardt, and Karaki. The collected writings of these authors include references to fifty-seven cases, but as a microscopical report is absent in a large proportion the diagnosis in many of these records is incomplete. Even in the last series of twenty-nine cases published by Karaki in 1908, ten only give a detailed report of the microscopical examination. Furthermore, this author includes four cases in which clitoris or labia are involved, and it is impossible to say where the primary lesion commenced.

After a careful analysis of the cases collected by the above-named authors, and the addition of several examples not included in their

lists, I have grouped together forty-three undoubted records. In the compilation of this list, which appears at the close of the paper, care has been taken to exclude all cases where doubt exists, either because no microscopical report is appended, or because parts other than the urethra or vestibule are involved in the growth. Possibly this ruling has led to the exclusion of several true instances, but the scientific value of cases where even slight doubt exists is but little.

My interest in the condition was aroused by a patient, aged 59, a 5-para, sent to me at the General Hospital, Birmingham, in January 1911, with symptoms of intense pain and difficulty on micturition. She first complained of local pain and discomfort in September, 1910. This rapidly increased in severity, and was associated with frequent and urgent micturition. When I first saw the woman in the outpatient room the bladder was distended and urine dribbling from the urethra. The passage of a catheter was attended with the most acute pain. On January 16, under an anæsthetic, an examination of the pelvic organs was made by Dr. Thomas Wilson and myself. The urethral orifice was dark purplish-red in colour, depressed, and somewhat puckered. The tissues of the vestibule, although much indurated, presented no ulceration, and hæmorrhage occurred only when a foreign body was introduced into the urethral canal. The vulval orifice was not contracted, and there was no leukoplakic condition of the mucosa. The urethra and bladder were explored by Kelly's cystoscope. The vesical mucosa was somewhat œdematous, but no nodule or induration was seen. On withdrawing the cystoscope an irregular, elongated ulcer, about $\frac{1}{2}$ in. length, was noted on the floor of the urethra, bleeding readily on contact, and surrounded by considerable induration. The ulcer occupied the anterior segment of the urethra, but did not involve the urinary meatus. The anterior vaginal wall appeared to be indurated in the line of the urethra, but a speculum showed that the mucosa was intact. The remaining pelvic organs were healthy, and no enlarged lymphatic glands were palpable in either inguinal region. The general condition was very feeble, and absolutely precluded the performance of any radical measures for the removal of the neoplasm. Even the simple examination and excision of the margin of the ulcer for microscopical purposes was followed by the most profound shock and pyrexia of 103° F., which only gradually subsided. Treatment with radium was attempted, but with little success, as the patient refused to attend for the necessary applications.

Death occurred from general asthenia at the end of May, 1911—i.e., eight months after she first complained of symptoms.

The microscopical report states that the neoplasm is a rapidly growing squamous-celled epithelioma, with well-marked leucocytic infiltration of the healthy tissues near the growing margin (*see figure*).

The comparative rarity of primary urethral carcinoma, compared with the incidence of vulval epithelioma at sites other than the vestibule, is of considerable interest. It has been pointed out before this Section by Berkeley and Bonney, that the vestibule and urethral orifice are practically never involved in the precancerous condition, described by them as leukoplakic vulvitis. The fact that primary carcinoma in this situation is rare is probably, therefore, but a corollary to the same observation. The investigations made by Hallé are interesting in this connexion. He finds that in some recorded cases a previous urethritis has occurred, and that this chronic inflammatory condition is followed by a sclerosing process to which he gives the name "urethral leukoplasia." This forms the starting point for a new growth of epidermal characters, which he designates as "canceroid."

It has been stated by Posner that in the male, out of twenty cases of primary urethral carcinoma, twelve showed a pre-existing gonorrhœal stricture, and Oberländer goes so far as to state that all instances of carcinoma in this situation, are preceded by chronic inflammation or stricture formation.

The relationship of urethral caruncle to carcinoma is interesting, in that several cases in the literature appear to have originated in this way, and the diagnosis was first suggested by the rapid growth and recurrence of the condition. The inflammatory origin of the majority of caruncles, and the preponderance of vulvo-urethral over true urethral carcinomata, added to the fact that the common seat of a malignant growth is the floor of the urethra near the external orifice—i.e., a similar situation to caruncle—are points in favour of an inflammatory lesion preceding the malignant growth.

Karaki, in pointing out that the line of union between two different epithelia exercises some predisposing influence to the incidence of malignant neoplasms, remarks that the apposition of urethral and vaginal epithelia may have some bearing upon the occurrence of carcinoma in this situation. Ehrendorfer, on the other hand, thinks that trauma, fissures and scars produced by labour or otherwise are predisposing factors.

CLINICAL FEATURES.

In considering the clinical features, it is well to adopt the terms suggested by Winkel and divide the cases into vulvo-urethral and urethral.

Vulvo-urethral growths are by far the more common. In my series of forty-three cases, thirty-two undoubtedly come under this category.



Section through growing margin of ulcer in urethra, showing squamous-celled epithelioma. No well-marked epithelial "nests" are present.

From a careful revision of the literature I am of opinion that three definite clinical types may be recognized:—

(1) An irregular, dark purple, papillomatous growth, which bleeds readily on contact, and which may be mistaken for a simple polypus or caruncular condition of the urethral orifice.

(2) An ulcer, produced by the breaking down of a nodule on the floor of the vestibule at the urethral orifice. The ulcer presents the usual malignant characters, having a hard, indurated, irregular margin

and friable, sloughing base. It rapidly involves the whole of the vestibule and spreads to the labia minora.

(3) An induration surrounding the urethral orifice, leading to depression, puckering and contraction of the orifice itself, but free from all ulceration and proliferation. This appears to be of slow growth, and clinically is a scirrhus.

Urethral growths are distinctly rarer, and only eleven are included in the list attached to this paper. Here again two modes of growth may be recognized:—

(1) An irregular, elongated ulcer, involving the mucous membrane of the urethral canal, and only exposed by urethroscopic examination. The ulcer is usually situated on the floor of the canal in the distal segment. It has the usual malignant characters and tends to extend towards the urethral orifice. It rarely involves the bladder. The case described by the author is included under this group.

(2) A peri-urethral induration, but free from ulceration until the late stages. A definite tumour is formed, which tends to occlude the urethral canal, and which involves the whole length of the urethra. This type is of slow growth and approximates to the scirrhus. In its later stages ulceration occurs into the vagina, urethra or vestibule.

It will be noted, therefore, that in all types of growth the last stages are similar, and in an advanced neoplasm it is impossible to say whether it was originally vulvo-urethral or primarily urethral.

SYMPTOMS.

The symptomatology of the condition is exactly what might be expected from the clinical features. The essential points are difficult, painful and frequent micturition, associated with more or less hæmorrhage, discharge, and general constitutional change dependent upon the pain and loss of sleep involved thereby.

The type of growth has a distinct bearing upon the symptoms. Thus, in the vulvo-urethral forms, the papillomatous growths give rise to hæmorrhage and pain as the predominant symptoms. The bleeding occurs quite apart from micturition, and has followed such acts as sneezing, coughing, &c. Pain is most marked in the ulcerating types, either urethral or vulvo-urethral. It is most intense during micturition and frequently leads to voluntary distension of the bladder. The passage of a catheter naturally is attended with the most acute pain. In the later stages, when ulceration has progressed and the vestibule is

extensively involved, the patient's condition is most deplorable, for she can neither sit nor stand with comfort, and is forced to lie in the dorsal position with the thighs widely abducted.

In the sclerosing types of the disease the symptoms appear to be more purely of a mechanical nature. Pain and hæmorrhage are slight until ulceration occurs, and the first symptom is difficulty in micturition. This is progressive, and in some cases complete retention is effected; in fact, this may be the first symptom that brings the patient under observation. These scirrhus forms are less rapid in growth and the prognosis after operation is better than in the papillomatous, polypoid and ulcerating types.

PATHOLOGY.

It is unfortunate that in many of the records of primary urethral carcinoma, the pathological appearances are not described in detail, and many otherwise good examples have to be rejected for this reason. The preponderating type of growth is undoubtedly a squamous-celled epithelioma. In the present series of cases are included twenty-seven pure examples of this neoplasm, and two, which are described by the authors as a combination of epithelioma and columnar-celled carcinoma. Pure adenocarcinoma is rare, and only fourteen examples are included in the list. It originates in the peri-urethral glands, and is analogous to the prostatic carcinomata of the male. Cases of this nature have been placed on record in this country by Battle and Boyd.

TREATMENT.

Whenever possible, wide excision of the urethra together with the inguinal glands should be practised. Although the latter are frequently uninvolved, sufficient cases are recorded to demonstrate the advisability of this procedure. When only the distal segment of the canal is affected it may be possible to leave sufficient mucosa to suture to the anterior vaginal wall. Even if the neck of the bladder is invaded and the sphincter must necessarily be sacrificed, in a few cases quite a good functional result is obtained, as recorded by Fritsch in Veit's "*Handbuch*." In these advanced cases, however, it seems better practice to close the vulval wound completely and establish permanent suprapubic drainage, as advocated by Battle and McGill.

Where operation is contra-indicated, as in the author's case, resort must be had to such therapeutic agents as the cauter, radium, or X rays.

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TABLE OF CASES OF PRIMARY CARCINOMA OF THE FEMALE URETHRA.

Case	Reporter	Date	Age	Type	Treatment	Microscope
1	G. Melchiorj	1869	65	Vulvo-urethral	Excision	Squamous-celled epithelioma
2	Labaye-Richet	1872	64	Urethral	"	Columnar-celled carcinoma
3	V. Winckel	1878	58	Vulvo-urethral	"	Squamous-celled epithelioma
4	Soullier-Picqué	1889	60	" "	"	Columnar-celled carcinoma
5	Lxoff	1889	46	" "	"	Squamous-celled epithelioma
6	Frankenthal	1889	43	" "	"	" "
7	Reichel	1891	64	" "	"	Columnar celled carcinoma
8	McGill	1890	50	" "	Suprapubic drainage and excision	Squamous-celled epithelioma
9	Oviatt	1893	47	" "	Cystotomy	Adenocarcinoma
10	Dietzer	1893	59	" "	Excision	Squamous-celled epithelioma
11	Zweifel	1893	38	" "	"	Epithelioma and cubical carcinoma
12	Price	1894	—	" "	"	Squamous-celled epithelioma
13	Battle	1894	60	Urethral	Excision, suprapubic drainage	" "
14	Hottinger	1896	65	Vulvo-urethral	Operation refused	" "
15	Bosse	1897	57	" "	Excision	Cubical carcinoma
16	Ochsner	1898	50	" "	Excision, internal sphincter left	Squamous-celled epithelioma
17	Percy	1898	38	" "	Excision	" "
18	Schramm	1899	56	" "	"	" "
19	Ehrendorfer	1899	62	Urethral	"	" "
20	Vineberg	1900	36	Vulvo-urethral	"	" "
21	Stanley Boyd	1901	51	Urethral	"	Columnar-celled carcinoma
22	Battle	1901	58	"	Excision, suprapubic drainage	" "
23	Kynoch	1901	49	"	Partial excision	Squamous-celled epithelioma
24	Zeitler-Hoffmeier	1901	67	Vulvo-urethral	Excision	Epithelioma and cubical carcinoma
25	Zeitler-Hoffmeier	1901	61	" "	"	Squamous-celled epithelioma
26	Zeitler-Hoffmeier	1901	50	" "	"	" "
27	Serph-Boursier	1901	69	" "	"	Adenocarcinoma
28	Wichmann	1901	43	" "	"	"

TABLE OF CASES OF PRIMARY CARCINOMA OF THE FEMALE URETHRA—(continued).

Case	Reporter	Date	Age	Type	Treatment	Microscope
29	Namba	1903	57	Urethral	Excision	Adenocarcinoma
30	Stanley Boyd	1905	51	Vulvo-urethral	"	Squamous-celled carcinoma
31	Auvray	1905	50	" "	"	" "
32	Knoll	1905	68	Urethral	Partial excision	Adenocarcinoma
33	Ball	1907	55	"	Excision	Squamous-celled epithelioma
34	Ball	1907	57	Vulvo-urethral	Palliative	" "
35	Croft	1907	37	" "	Nil	? Epithelioma (squamous-celled)
36	Boursier	1907	68	" "	Excision	Squamous-celled epithelioma
37	Karaki	1908	53	Urethral	"	" "
38	Boursier	1908	52	Vulvo-urethral	"	" "
39	Burckhardt	1906	68	" "	"	" "
40	Hirst	1909	—	" "	"	Adenocarcinoma
41	McMurtry	1908	26	" "	"	"
42	McMurtry	1908	47	" "	Excision, sphincter saved	"
43	Whitehouse	1911	59	Urethral	Palliative; radium	Squamous-celled epithelioma

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DISCUSSION.

Dr. CUTHBERT LOCKYER had seen three cases of primary carcinoma of the urethra, two in his own hospital practice and one in the private practice of his senior colleague, Dr. Hubert Roberts. The latter was a hopeless case in which nothing could be done to relieve the patient. In the first of his own two cases the growth presented through the meatus urinarius as a dark smooth mass, the size, shape, and colour of a black cherry; it was attached to the floor of the urethra by a base 1 in. in diameter. Dr. Blacker, who saw the case and examined under anaesthesia, advised a free removal of the urethra, and this was done: $1\frac{1}{2}$ in. was the longitudinal measurement of the canal after removal. The sections proved the tumour to be an adenocarcinoma growing from the peri-urethral glands. The patient made a good recovery; the operation was performed two years ago, and there has as yet been no recurrence. The second case presented a totally different appearance. The growth presented as a delicate villous papilloma of the floor of the urethra and proved to be an epithelioma. The operation was performed in 1909, and, unfortunately, the patient had been lost sight of.

Dr. ROBERTS remembered the case referred to by Dr. Lockyer. It occurred in a German lady, aged 49. The growth was a primary carcinoma of the urethra. The whole of the urethral canal was involved and it was quite inoperable. Sections proved it to be a columnar-celled cancer. The patient suffered great distress and there was cystitis and hæmaturia. She died four

months afterwards. Dr. Roberts was interested to hear Dr. Whitehouse's remarks on draining the bladder in such cases. Dr. Roberts thought that a vaginal cystotomy would be perhaps preferable to suprapubic drainage.

Dr. TATE referred to the difficulty that sometimes occurred in diagnosing some cases of prolapse of the urethra from malignant disease. He had seen two cases in which the prolapse had the appearance of a circular protruding growth, indurated on the surface and having a purplish colour very suggestive of malignancy. In the former of the two cases the swelling was removed freely, but when examined microscopically it proved to be non-malignant.

Dr. BECKWITH WHITEHOUSE, in reply, thanked the Section for the kind way in which his communication had been received. He was interested to hear of the cases mentioned by Dr. Hubert Roberts, Dr. Cuthbert Lockyer and Dr. Walter Tate, and thought that if all cases were published it would be found that carcinoma in this situation was not such a very rare condition. In all, about 150 cases had been described, but for reasons already given he had felt compelled to reduce this list considerably. He was glad to hear that Dr. Victor Bonney agreed with the theory of chronic inflammation pre-existing the incidence of carcinoma. The common situation of the growth in this position certainly appeared to afford some evidence in confirmation of the theory. With regard to the second case described by Dr. Cuthbert Lockyer, from the description Dr. Whitehouse would include it under the first group of vulvo-urethral neoplasms—viz., the "papillomatous growths which may be mistaken for a simple polypus or caruncular condition of the urethral orifice." He was interested in Dr. Tate's experience, and appreciated the difficulty that might arise in the diagnosis of malignant disease from chronic urethral prolapse.

A Case of Ovarian Pregnancy.

By EARDLEY HOLLAND, M.D.

THIS case has a double interest: firstly, the interest associated with the occurrence of pregnancy within the ovary; secondly, a still greater interest associated with a peculiar structure found within the blood-clot from a recently ruptured follicle in the opposite ovary. It may be stated at once that the specimen has no more than an anatomical value, as being one of ovarian pregnancy: it throws no light on the mode of embedding of the ovum within the ovary or on its subsequent development. Further, the authenticity of the specimen rests on the fact that the gestation sac is completely encapsulated by ovarian tissue; additional criteria, such as the condition of the corresponding tube and the relation

of the ovarian ligament, are obviously unnecessary. The period of the pregnancy is, as far as can be estimated, about four weeks.

I most gratefully acknowledge my indebtedness to Dr. John Phillips, under whose care the patient was, for permitting me to publish these notes.

CLINICAL HISTORY.

The patient, aged 40, had been married for twelve years; she had never borne children, but had miscarried once, nine years before the present pregnancy. She was admitted to King's College Hospital in March, 1909. In October, 1908, after a period of six weeks' amenorrhœa, she was suddenly seized with severe abdominal pain, accompanied by uterine hæmorrhage. She went to bed and in fourteen days was sufficiently well to get up; after three days she had another attack which compelled her to return to bed for a few days. Throughout the following December, January and February she menstruated regularly and, except for a constant slight, blood-stained discharge, was quite well. On March 6 she had a third attack, and her doctor sent her into hospital with the diagnosis of extra-uterine gestation. On March 20 Dr. John Phillips opened her abdomen: some recent blood-clot was found in Douglas's pouch and the right ovary, considerably enlarged and adherent to the posterior surface of the right broad ligament and floor of the pelvis, was removed without much difficulty, though when the ovary was pulled from its bed there was brisk hæmorrhage which ceased immediately the broad ligament on either side of the enlarged ovary was clamped. The left ovary, which was not enlarged, had on its posterior surface a small rent from which blood was oozing and through which a clot was projecting. This was evidently a recently ruptured Graafian follicle. The clot was expressed and the oozing controlled by two sutures. The patient made a straightforward recovery.

DESCRIPTION OF THE SPECIMEN.

The specimen consists of the enlarged right ovary, to which is attached part of the mesosalpinx and Fallopian tube. The ovary forms an ovoid swelling and measures 6·3 cm. in its greatest and 4·5 cm. in its smallest diameter. Its external surface, except for an irregular opening on the anterior aspect, is smooth and of a bluish-grey colour, very similar to the colour of a simple cystadenoma. On the anterior surface,



FIG. 1.

Anterior surface of the right ovary. Part of the tube and mesosalpinx are attached to the superior border; immediately beneath the two cut edges of the anterior and posterior layers of the broad ligament which unite as they pass outwards to form the infundibulo-pelvic fold, is the site of rupture; below this is the terminal portion of the ovarian fimbria.



FIG. 2.

Cut surface seen on bisection of the ovary. A capsule of stretched ovarian tissue encloses blood-clot, in the centre of which lies the gestation sac. The clot is mostly pale and laminated, but there are also dark areas of recent clot.

just beneath the hilum of the ovary, is a large opening through which projects old blood-clot: this is where the ovary was adherent to the pelvic peritoneum and is the site of rupture of the gestation sac. On the outer pole of the ovary is the ovarian fimbria. These appearances are seen in fig. 1.

After having been hardened in formalin, the ovary was bisected and the cut surface seen in fig. 2 was revealed. A capsule, consisting of tunica albuginea and of stretched ovarian tissue, encloses blood-clot in the midst of which lies the gestation sac. A complete section, parallel to the cut surface and $\frac{1}{4}$ in. in thickness, was removed for embedding in paraffin and was cut in serial sections. Fig. 3 is a photomicrograph of one such section.

(a) *The Capsule.*—The capsule, which completely surrounds the specimen except at the hilum and at the point of rupture, is composed of the stretched ovary. The thickness of the capsule varies in different parts. It is thickest at the pole remote from the hilum, and here several follicles, primordial ova and corpora albicantia are met with. At other parts the capsule consists merely of the tunica albuginea and a few underlying connective tissue fibres. This complete capsule of ovarian tissue is the absolute evidence upon which the authenticity of the specimen rests. Where the ovarian tissue and blood-clot are in contact no special structure denoting lutein or decidual cells is apparent. In fact, a disappointing feature of the specimen is the lack of fine histological details (except in the ovarian tissue) owing to autolytic changes. It is only natural that such changes should have occurred when it is recollected that the specimen was not removed until five months after the patient's first attack of pain and hæmorrhage, at which time it may be assumed that the connexions between the ovum and its site of implantation were originally disturbed.

(b) *The Blood-clot.*—This is mostly pale in colour and laminated, and is evidently the result of recurrent small hæmorrhages. There are some dark red areas of recent hæmorrhage situated, for the most part, near the point of rupture. Scattered throughout the clot are a few degenerated villi, greatest in number near the thick part of the capsule.

(c) *The Gestation Sac.*—This is shrunken and collapsed and consists of a well-marked chorionic membrane with remnants of trophoblast; within this and joined to it by an amnio-chorionic pedicle, is part of another membrane which is evidently the amnion. No embryo was found and the only trace of it was a little amorphous material within the gestation sac.



FIG. 3. Photomicrograph of a section through the whole ovary, corresponding very nearly to the cut surface seen in fig. 2. The capsule of ovarian tissue is thickest in the upper part of the figure: a mature follicle is seen. The gestation sac is shrunken and is completely enclosed by a chorionic membrane; the amnion is incomplete and the amnio-chorionic stalk is seen uniting it to the chorionic membrane. ($\times 34$.)

The Clot from the Left Ovary.—This clot was expressed from what appeared to be a recently ruptured follicle. As it seemed likely that it might contain remnants of the shed membrana granulosa, and even, perhaps, the ovum itself, it was, merely out of curiosity, embedded in paraffin and cut into serial sections. I was rewarded by finding a very remarkable structure running through eleven sections. It is composed of multinucleated protoplasm and, obviously, once had a definitely arranged form, but it must have been mutilated during the expression of the clot from the follicle. The drawings (fig. 4) demonstrate this structure better than a written description. One section shows a cavity within a mass of multinucleated protoplasm which, in distal and proximal sections, assumes a crescentic form. I think there is no doubt that this structure is trophoblastic in nature. Professor Keith, who kindly examined the sections, writes: "I am sure it is embryonic tissue and am pretty certain it is not an embryo but a tag of syncytial trophoblast." The occurrence of pregnancy was possible, as the patient was leading a married life before her last attack of pain and hæmorrhage on March 6. That this structure is part of a fertilized ovum within a Graafian follicle can only be hazarded, but if it is, it stamps the case as a quite unique one of bilateral ovarian pregnancy. Another interpretation of this structure is that it is an unfertilized ovum which has undergone division from a stimulus other than a spermatozoon, comparable to the division of an ovum from physical or chemical stimuli, originally noted by Loeb, in the ova of sea-urchins. Still another interpretation is that it represents the cells of the membrana granulosa which have undergone some peculiar change. Another structure ran through sixteen sections, but is very different to the foregoing. It consists of a strip of closely packed polygonal cells. Whether it is part of the shed membrana granulosa or is composed of cells of the embryonic epiblast of an early ovum is impossible to decide. I am inclined to believe the former.

Report of the Pathology Committee.—"We have examined the sections showing trophoblastic tissue in a clot which was expressed from a recently ruptured follicle in the left ovary in a case where ovarian pregnancy had occurred in the right ovary, and we agree that this tissue is plasmodial and therefore embryonic."

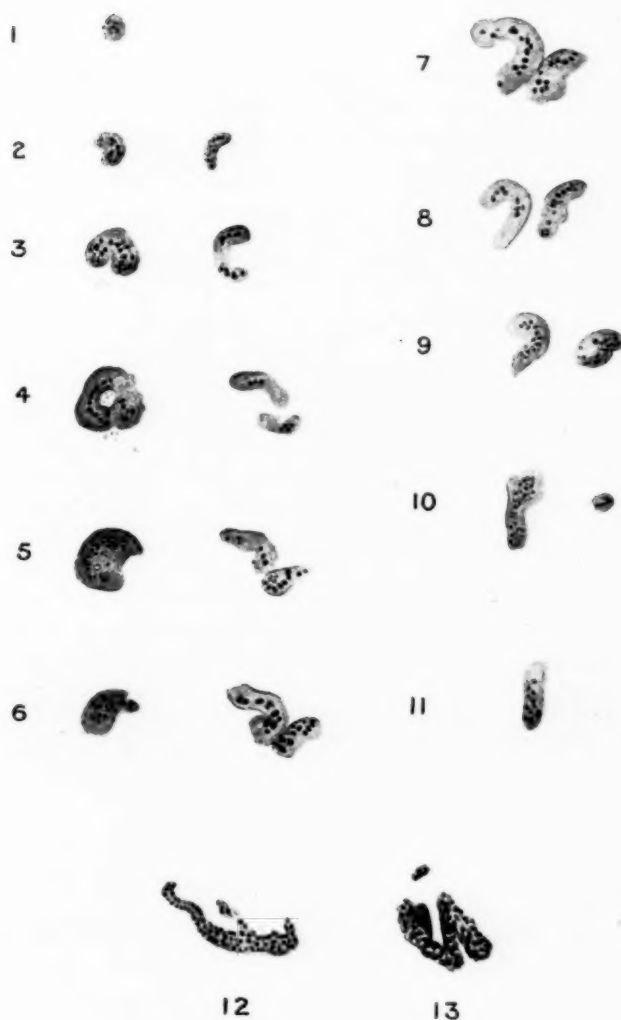


FIG. 4.

Plasmoidal structure found in blood-clot expressed from recently ruptured follicle in the left ovary. Numbers 1 to 11 are drawings from the eleven consecutive serial sections in which the structure was found. The structure has doubtless been broken during the expression of the clot, and the two separate portions in which it now appears formed originally, in all probability, a single structure. Numbers 12 and 13 are drawings of two sections which show a very different structure to Nos. 1 to 11. This structure ran through sixteen sections and is composed of a closely packed collection of polygonal cells with large nuclei: the series of sections in which it was found was separated from the sections showing the plasmoidal structure by six blank sections. It is, in all probability, part of the cast-off membrana granulosa, though it may possibly be part of the embryonic rudiment of an early ovum.

DISCUSSION.

Dr. STEVENS agreed that the peculiar tissue found in the Graafian follicle of the unaffected ovary had the histological characters of trophoblast. He could not, however, make any suggestion as to how it had originated.

Dr. BLAIR BELL said that there could be no doubt that this was a genuine case of ovarian pregnancy. Such cases he thought helped to endorse the view he had long held that ectopic pregnancies were more of the nature of an accident than the result of disease. He did not deny that previous salpingitis might have occurred in some cases of tubal gestation; but he thought the real cause of this form of ectopic pregnancy was the same as that which gave rise to an ovarian or primary abdominal pregnancy. That is to say, wherever the ovum happened to be by the time the trophoblast was developed there it would become implanted. We knew that it usually took from seven to ten days for the ovum to reach the uterus, consequently much depended in regard to the site of implantation upon the position of the ovum when fertilization occurred. If this were effected in the tube—the usual place—the ovum would probably reach the uterus in safety; but if fertilization took place in the ovary or peritoneal cavity then the ovum might become embedded in the ovary, on the peritoneum, or in the wall of the tube.

Dr. LOCKYER stated that Dr. Holland had proved his case to be one of ovarian molar pregnancy beyond any doubt whatever. The point which was difficult to settle was what was the meaning of the trophoblastic structure found in the recent blood-clot which came from the opposite ovary. It had the appearance of a ring of undifferentiated protoplasm, with distinct circular nuclei, and its similitude to trophoblast was so striking as to render it difficult to call it anything else, and its presence certainly suggested but did not *prove* the existence of another coincident ovarian gestation.

Dr. BECKWITH WHITEHOUSE said that he was much interested in the communication that Dr. Holland had made to the Section, inasmuch as he had himself reported in the *British Medical Journal* for 1910 a specimen which had much in common with the second ovary described by Dr. Holland. This specimen had been removed by Mr. Lucas at the General Hospital, Birmingham, in 1909, and was submitted to Dr. Whitehouse for a pathological report. He found that profuse hæmorrhage had occurred from the surface of the ovary and from the macroscopical appearance suggested that the case was one either of ovarian pregnancy or hæmorrhage from a Graafian follicle, as described by Dr. Cuthbert Lockyer. He submitted the ovary to serial section and was surprised to find trophoblastic elements present with much extravasation of blood, but a complete absence of chorionic villi or other evidence of gestation. He therefore had published the case as one of "probable ovarian pregnancy," as he did not feel justified in considering it an undoubted example

of the same. He would very much like the Pathology Committee to express an opinion as to what was the significance of trophoblastic elements in the ovary in the absence of chorionic villi, as was the case in Dr. Holland's second specimen and his own. In reply to a request by the President, Dr. Whitehouse said that he would be very pleased to place the material of his case at the disposal of the Pathology Committee in order that a definite opinion might be reached. He thanked Dr. Holland for bringing forward his very interesting communication.

Sequel to a Case of Cystic Degeneration of Chorion.

By DRUMMOND MAXWELL, M.D.

M. T., AGED 21. Admitted November 10, 1910, discharged November 26. Patient had been married six months; seven weeks before admission, hydatid mole was diagnosed. Uterus evacuated by doctor under CHCl_3 and curetted. Three weeks ago—i.e., four weeks later—patient passed some more "white stuff" like the tissue that came away before. Patient has had blood-stained discharge ever since operation, on and off.

Dr. Lewers's note (November 10, 1910): Uterus ordinary position, freely movable, considerably enlarged; os patulous.

Operation (November 15, 1910): Dilatation to Hegar 19; finger introduced; posterior wall of uterus smooth, anterior wall rough. With ovum forceps typical cystic tissue removed; not a very large amount removed, about 2 dr. After use of ovum forceps, blunt curette used over whole surface of uterus. No palpable lutein cysts felt in ovaries.

No further hæmorrhage occurred. Patient was discharged November 26, 1910, in apparent good health.

Pathological note (November 15, 1910): Macroscopic description of tissue removed—Numerous vesicles, the largest being the size of a pea. A few firm pieces of tissue with and without recent growth.

Pathological Report.—Malignant hydatidiform mole. In the section there are some large œdematous chorionic villi, and in close relation to these are portions of uterine wall. The uterine wall is muscular and of spongy appearance, owing to numerous large and small capillary spaces. One of the villi lies in such a space. In the large and small capillary spaces there are numerous large chorionic epithelial cells. Isolated cells also lie between the muscle bundles.

Second entry, London Hospital (March 7, 1911, to May 1; discharged): Patient left hospital on November 26, 1910, and remained at home fairly well till January, 1911; patient then had a hæmorrhage. She returned to hospital, and was examined by Dr. Lewers. No enlargement of uterus detected. Ergot pills prescribed. Another hæmorrhage a few days later; still slight loss of blood on admission. Patient is profoundly anæmic. Red cells, 3,250,000; hæmoglobin, 35; colour index, 0.5.

Curettage, second time, Dr. Lewers (March 17, 1911): Ten days after admission, dilatation, tent 1, Hegar 19. Finger introduced detected some irregularity at fundus, right side. Light blunt curettage brought away a small nodule of tissue, $\frac{2}{3}$ in. by $\frac{1}{3}$ in. A sharper curette brought away what appears to be a small collapsed vesicle. Finger introduced feels a distinct depressive gap at right cornu. Left side feels normal.

Pathological Report (March 17, 1911).—Tissue, a typical collapsed vesicle. There are a few dropsical villi which are covered with many layers or solid papillary projections of chorionic epithelium. There are portions of necrotic tissue which contain numbers of large chorionic epithelial cells. There are some small portions of mucosa and muscularis, on the surface of which there are masses of chorionic epithelium.

Patient's blanched condition suggested the possibility of widespread blood destruction by a latent syncytial metastasis which produced no physical signs. The thoracic viscera were examined on March 27, 1911, by Dr. Kidd, who detected no abnormal physical signs in the chest. No further uterine hæmorrhage.

In the absence of clearer indication for further operation, patient's general condition contra-indicated further surgical interference owing to the high grade of anæmia. For the next five weeks medical treatment was limited to combating the anæmia by Pil. ferri sulph. exsicc. and Residuum rubrum. Patient very rapidly improved under this régime, and a later blood count showed an improvement from 3,500,000 and 35 per cent. hæmoglobin to 4,500,000 and 70 per cent., and rise of the colour index from 0.5 to 0.8.

Third exploration of uterus (April 21, 1911), five weeks later: Dr. Russell Andrews, in the absence of Dr. Lewers, explored the uterus after dilatation to No. 21 Hegar. The gloved finger introduced detected a small irregularity (size of a pea) and slight roughness at the right upper angle. The uterus was curetted lightly with a blunt curette, the tissue removed appearing, macroscopically, to be normal endometrium. Microscopical investigation confirms this.

Pathological Report.—Both normal and necrotic desquamated endometrium seen. No chorionic epithelium present.

A few shreds of muscle can be seen, but no trace of trophoblastic invasion. Patient was discharged ten days later very much improved—May 1, 1911.

Latest report: Patient seen at the London Hospital, November 20, 1911, perfectly well; two months' amenorrhœa; early pregnancy diagnosed.

It is only by a collection of records of this kind that we can hope to formulate lines of treatment and after-treatment, and come to a clear agreement as to the significance attached to the presence of trophoblastic tissue persisting *in utero* after the cystic mole has been removed. For my own part, I frankly confess that, had the responsibility of this case been mine, I would unhesitatingly have removed the uterus forthwith as soon as I had evidence of the persistence of active trophoblastic tissue; and that so many months (five) after the original cystic mole had been evacuated and the uterus explored three times in all by: (a) Dr. Drought, September, 1910; (b) Dr. Lewers, London Hospital, November, 1910; (c) Dr. Lewers, London Hospital, March 17, 1911. It should be instructive to hear what the views of members are on this point, and what their treatment would have been, based on the microscopic report of curettage (March 17, 1911).

Are there any histological features whereby we can distinguish the trophoblast persisting *in utero* as an innocent parasitic growth, nourished by the maternal circulation without invasion of the maternal tissues, from trophoblast of the more dangerous and infiltrating type? A simple answer to this question would appear to be afforded by the presence or absence of the trophoblast in the deeper muscle-layers of the uterus. Yet here, in section, a definite plasmodial mass is shown lying in a muscular bed, and the sequel of the case we know to be complete recovery. Must we, in these cases, wait for further clinical evidence of malignant proliferation before deciding on removal of the primary focus? This seems a most unsatisfactory position.

One conclusion is forced on the reader of clinical accounts of removal of uterus for this condition. It is that, in the light of this case, many such hysterectomies were probably unnecessary, though justified in the present state of our knowledge. To add to my own position of uncertainty in these matters, I have just heard that a case of mine at the Samaritan Hospital, seen first in August, has symptoms of local persistence of trophoblastic tissue.

The patient was admitted for a prophylactic exploration of the uterus, a few days after spontaneous evacuation at her home of a vesicular mole. Blunt curettage after digital exploration brought away no tissue recognizable, either by naked eye or microscope, as a relic of a cystic mole. I have just heard of her second admission to the Samaritan Free Hospital under my colleague Dr. Roberts, who has discovered, on uterine exploration, a polypoid mass with obvious microscopic cystic villi.

DISCUSSION.

The PRESIDENT (Dr. Amand Routh) said that Dr. Maxwell's case bore out the recently expressed view that there were not only cases of benign and malignant hydatidiform degeneration, but also two distinct types of chorion-epithelioma, one of which was less malignant than the other and capable in some cases of being overcome by the patient's power of resistance.

Dr. ROBERTS was glad to be able to give a further clinical history of the case Dr. Maxwell spoke of, as the patient was now in Dr. Roberts's ward at the Samaritan Hospital. Dr. Roberts thought the case of very great interest and hoped to bring it forward at a future meeting of the Society. Since Dr. Maxwell had curetted, the bleeding had recurred with curious rigors and some loss of flesh. Dr. Roberts had re-explored the uterus, with the result that further cystic remains had been found together with solid growth, sections of which showed it to be a syncytioma. He had therefore removed the uterus by abdominal panhysterectomy. He hoped to be able to show the uterus to the Society shortly, together with microscopical sections. It was very evident that a syncytial growth had resulted from the original mole and that it had all but perforated the uterus near the left Fallopian tube.

Obstetrical and Gynaecological Section.

January 4, 1912.

Dr. AMAND ROUTH, President of the Section, in the Chair.

Angiochorioma of Placenta.

By R. DRUMMOND MAXWELL, M.D.

THE patient, from whom the specimen comes, was a woman, aged 32, in labour for the sixth time. She was delivered in the London Hospital Out-patient Charity. Her labour was abnormal: placenta prævia, with transverse presentation. There was considerable *ante-partum* hæmorrhage. Internal version was effected, after the cord was pulseless and prolapsed: there was considerable *post-partum* hæmorrhage as a result; the partially separated placenta was hurriedly detached. Hæmorrhage continuing, the hand was inserted into the vagina with the object of carrying out bimanual compression, when the mass was discovered lying loose in the vagina. Unfortunately the placenta and membranes were not preserved, and though an immediate return was made to the house, the secundines had already been destroyed. The evidence of the tumour will, I think, convince observers that it had been attached to the placenta by a vascular pedicle, remains of which can be seen, and I would suggest the separation was brought about in the course of version and extraction of the fœtus.

The tumour consists of a dark red lobulated mass, deeply engorged with blood in the recent state. It is uniformly covered by a smooth, structureless membrane, with no trace of investing capsule. A large radicle of the umbilical cord (artery and vein) enters the tumour at what may be described as its hilum. At no spot on the surface can any trace of a "maternal" surface (comparable to that of a normal placenta) be detected, implying that the tumour had no direct connexion with the uterine wall. Its vascular supply appears to be derived solely from

special umbilical vessels. There seems to be little doubt that whatever the character of the new growth, it certainly possesses one of the properties of new growth in that the tissue subserves no function and played no part in the vital processes of foetal and maternal vascular interchange.

As regards the rarity of this type of tumour, the usual experience of abnormal placental growths is generally limited to subamniotic (cystic) changes, vesicular mole, infarctions and a few abnormalities in size and shape of everyday occurrence. The nature of the tumour was not apparent till sections had been examined and the literature investigated. Fortunately, in Kaufmann's "*Lehrbuch der speziellen pathologische Anatomie*," is found a full clue to the literature, under the heading of "*Geschwülste der Placenta*." Pitha¹ is the best reference for anyone interested in the subject, for a complete bibliography concludes his monograph.

Rarity: Apparently ranging over many years of modern work, from Virchow to the present date, only about sixty-four of these cases have been recorded, and there is one significant fact to be noted, they are all in connexion with institutional or hospital practice. Many must have escaped detection in private practice, but a good number of my colleagues I found were, with me, quite unaware of this type of tumour.

Association: It has always been met with in connexion with a healthy, functioning placenta, associated in the majority of cases with a live, full-time child. This fact, I think, should eliminate any antecedent inflammatory ætiology. It also establishes its slow rate of growth *pari passu* with the placenta. It has never occupied more than half the area of the placenta, and in the majority of cases a much more limited section than this.

Microscopic descriptions: Practically all the authors are in agreement that microscopic sections show a tumour composed of young embryonic connective tissue stroma, identical with that of early chorionic mesoblast; that scattered through the stroma are large capillary spaces lined by a single layer of endothelium, and that the surface is covered with epithelial cells identical with Langhan's layer. The tumour, however, shown here lacks all trace of such epithelial covering. I do not, however, think this absence of foetal epiblast is sufficient to exclude it from the list of these aptly named "*angeiochoriomata*," as Dienst termed them.

¹ *Ann. de Gyn. et d'Obst.*, Par., 1906, iii, pp. 232, 269, 360.

Situation: As regards the situation of the tumour, it has been met with between the maternal and foetal surfaces of the placenta; it can be easily shelled out from its surrounding bed, since it in no way derives any of its circulation from contiguous placenta. Most of the authors have called attention to the special blood supply directed solely to the tumour by vessels running direct to it from the cord, either as a velamentous or succenturiate supply. Some authors have regarded it as an abnormally developed cotyledon. It has actually been seen in connexion with a succenturiate lobule, while others, again, have recorded the presence of a pedicle containing attenuated vessels joining it to the main placenta.

Appearance and size: It is generally rounded, lobulated and bossed. Galabin, in 1885, described his specimen as the size of a human heart. The majority are much smaller, and though several of these tumours have been met with in one placenta a single tumour is the more common. One must single out Galabin's case, a description of which, with two reproductions of the microscope sections, will be found in the *Obstetrical Society's Transactions*, 1885.¹ The description and microscope sections would aptly represent the present tumour, save that the foetal epiblast is shown in the reproductions. I have previously noted its absence in the present case. Galabin was led to describe his case as a fibro-sarcomatous tumour of the placenta, the fibrillated characteristics of the stroma being not then recognized as embryonic mesoblastic tissue.

Pigment granules have been detected scattered through the stroma and blood spaces of some of the specimens. Their presence has been held to throw light on the ætiology, as pointing to venous stasis. These pigment granules are not to be seen in the specimen exhibited. I am inclined to think that some of these pigment granules have been mistaken for the nucleated red cells naturally found in foetal blood, and well marked in this case.

CONCLUSION.

How are all these observations to be correlated with the view to arriving at a correct conception of this class of tumour? Are we investigating a case of abnormal development of a primary villus stem, or a primarily abnormal vascular supply of a limited area of the chorion—i.e., an abnormally developed cotyledon? Judging from the frequently recorded "direct" blood supply of these tumours, I am inclined to think

¹ *Trans. Obstet. Soc. Lond.* (1885), 1886, xxvii, p. 107.

that a very probable explanation lies in this latter direction. It is certainly well illustrated in this case. This fixes the incidence of the tumour at a very early foetal date, between the second and third week; establishes it as a tumour of very slow growth, innocent in character, and compatible with normal pregnancy. An elongation of this vascular pedicle of special umbilical cord vessels, or pressure on them, may produce venous stasis in the affected early villus stem, and a consequent abnormal production or proliferation of capillary endothelium. Several authors support this view. It has been suggested also that at the stage of vascularization of the chorion, an atypical vascular branching may take place and angeiomatous tissue develop.

It was hardly probable that previous endometrial changes (inflammatory or otherwise) could have escaped being cited as an aetiological factor: I think we can dismiss it at once. The limitation of this growth to a portion of the chorion, its occurrence in association with twins, its association with normal full-time labour, all render this explanation extremely improbable. Indeed the absence of any direct relation to the maternal wall shown in this case disproves it at once. I should be inclined to explain the aetiology of this tumour in the following way: Between the second and third week of pregnancy some abnormal method of blood supply impaired the vascularity of a primitive cotyledon; venous congestion of the lobule ensued; venous stasis with abnormal conditions of intracapillary pressure set in and led to formation of angeiomatous tissue. Were it not for the frequently recorded abnormal blood supply and special vessels, I do not think it would be necessary to invoke circulatory obstruction as playing a prominent part in the aetiology, since capillary angeiomata are relatively common congenitally.

One point I admit puzzles me in the present case: what has become of the foetal epiblast that originally must have invested this lobule? It is impossible to conceive of foetal mesoblast proliferating without an epiblastic covering. I believe in this case there was an original investiture of epiblast, but since the lobule in no way functioned as vital placenta it has atrophied or has been shed and disappeared.

Dr. LOCKYER had only once had an opportunity of examining a specimen of placental new growth. It was sent to him by a colleague for investigation. The tumour was the size of a walnut. It appeared to have been pedunculated. On section it was a fibro-angioma. The gestation, labour and puerperium were quite normal, and the growth gave rise to no clinical symptoms whatever. Dr. Lockyer congratulated Dr. Drummond Maxwell on having rescued a rare tumour from oblivion, and quite agreed with him as to its nature and the nomenclature chosen for its description.

Exfoliation of the Endometrium during Menstruation.

By W. BLAIR BELL, M.D.

THE first of these specimens consists of the two halves of a cast of the uterus (fig. 1). It was obtained, more or less by accident, in the out-patient room on August 11, 1911, from Mrs. L., aged 32, who

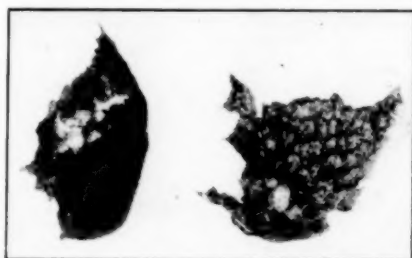


FIG. 1.

The two halves of a cast. (I.)



FIG. 2.

One half of a cast obtained later from the same patient. (I.)

happened to present herself on the first day of menstruation, and from whom I was proceeding to collect the menstrual discharge for another purpose. While so doing I found these pieces of membrane in the vagina. The second of the two mounted specimens is a rather smaller piece of membrane (fig. 2). This was passed by the same patient on December 26, 1911, while in the hospital, to which she was admitted

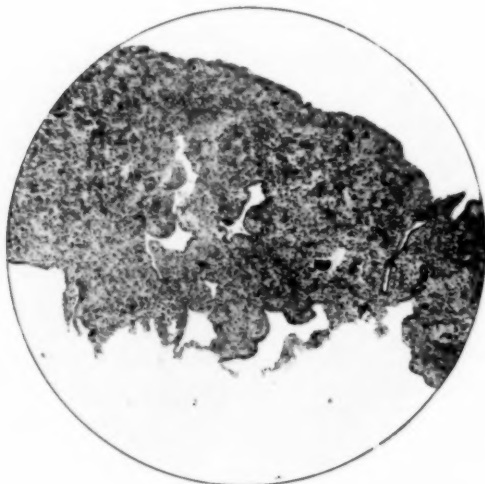


FIG. 3.

Section of one half of a cast. ($\times 50$.)

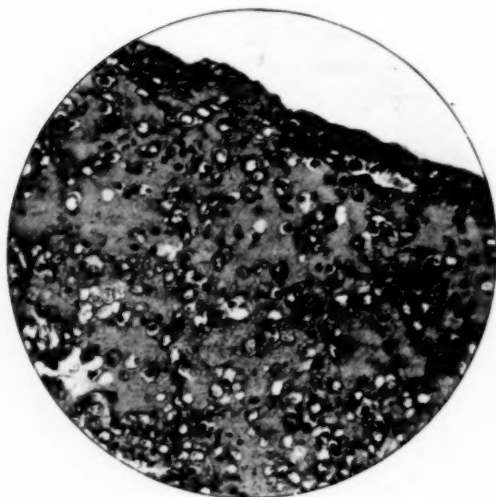


FIG. 4.

Decidual reaction in the stroma of the exfoliated endometrium. The surface epithelium lining the cavity of the uterus is shown. ($\times 250$.)

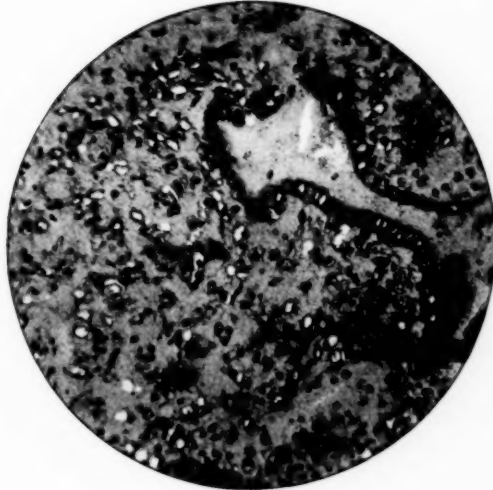


FIG. 5.

A gland lying in the stroma of the exfoliated endometrium. ($\times 250$.)

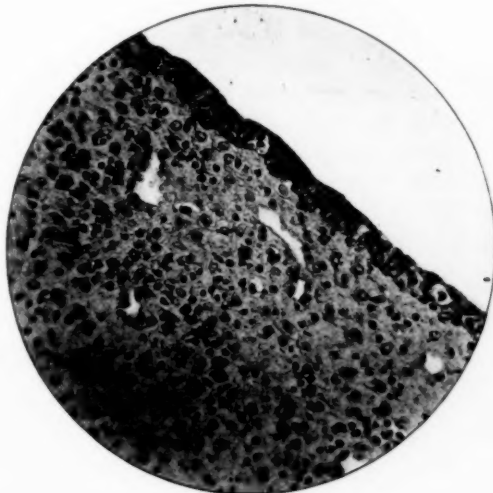


FIG. 6.

Decidual reaction in the cast obtained from another case. ($\times 250$.)

over a menstrual period for the purpose of obtaining a further specimen. It will be noted that one surface—that detached from the uterine wall—is shaggy, while that lining the uterine cavity is smooth.

Microscopically the membrane presents a somewhat typical appearance. In a low power view (fig. 3) the two surfaces are well shown, likewise distorted glands in the interior of the membrane. Under a high power (fig. 4) it presents the so-called decidual appearance and this is due to swollen and degenerated cells lying in a somewhat homogeneous stroma, which apparently consists of blood, altered blood and serum. This extensive effusion of blood confirms my view of the aetiology of the condition, which I have explained elsewhere.¹ The epithelium covering the surface and lining the glands (fig. 5) shows a similar change to that seen in the cells of the stroma. Lest anyone be disposed to consider this a somewhat unique change I show an illustration (fig. 6) taken from another case under the care of my colleague, Dr. Grimsdale. It may be familiar to some, for I have already used it as an illustration. Having on several other occasions seen exactly similar appearances in the smaller shreds obtained from time to time in menstrual discharge, I have come to look upon this degenerated decidual appearance as typical of these membranes, although I admit one does occasionally see variations, which are, I believe, due to differences in the degree of degeneration and in the amount of blood effused into the stroma.

With regard to the question of the so-called 'solid' casts, it seems to me that we are probably dealing with a membrane which has become rolled up and retained for some time in the uterine cavity; but I have had the opportunity of examining only one specimen of this sort. I think, however, that a careful examination of a number of specimens of 'solid' casts would prove the correctness of the views thus stated. The membranes shown to-night were passed on the *first* day of menstruation as already mentioned. There are some who still look upon all casts of this sort as abortions; but I am absolutely convinced this is a pathological error.

DISCUSSION.

Dr. GRIFFITH asked if the extrusion of the membrane was accompanied by pain, and remarked on the difficulty of explaining the detachment of so delicate a membrane. The exceedingly beautiful sections exhibited presented characters different from any he had seen in cases in which pregnancy could be excluded.

¹ "The Principles of Gynecology," 1910, p. 205.

Dr. HERMAN said that readers of the *Transactions of the Obstetrical Society of London* might remember a paper by Dr. Cory (in vol. xx) in which he related the case of a woman who while she was cohabiting with her husband passed a membrane every month; when her husband was away from home she passed no membranes, but when cohabitation was resumed she again passed membranes. Such a case was evidently an instance of monthly abortions. He did not assert that every case of membranous dysmenorrhœa was of this nature, but only that some were.

Dr. HANDFIELD-JONES thought that these membranous casts, thrown off at the time of menstruation, were caused sometimes by early conceptions, and at other times were the result of chronic congestive processes. He quoted a case, in illustration of the first theory, in which a patient regularly discharged these membranes during her married life, but ceased to exfoliate them when she became a widow. He also wished to know Dr. Bell's views regarding the production of pain during the delivery of these membranes, and he quoted a case where a young unmarried woman regularly passed well-developed casts of the uterine cavity without any suffering.

Dr. LOCKYER was very interested in the specimen, which had a totally different appearance from those shown at the Obstetrical Society by other observers, including Dr. Eden and himself. In Dr. Bell's sections the cells were large and decidual in appearance, they lay in a hyaline or ground-glass-like matrix, giving a general similarity to a decidual membrane which had suffered degeneration. Dr. Bell had not stated anything with regard to the possibility of pregnancy, but that important point must be cleared up. If conception could be definitely excluded then the features of this specimen must be considered to be unique as far as Dr. Lockyer's experience went. Menstrual casts were usually thin diaphanous structures composed of delicate embryonic tissue; the cells were small, shrunken and branching; the stroma was formed of a slender adenoid reticulum, the blood-vessels represented by a single layer of endothelium and the glands formed of very short cubical or almost spherical cells arranged in a single layer. The naked-eye appearances of Dr. Bell's specimen were just as unlike the ordinary membrane shed by "exfoliative endometritis" as were the microscopic features; it was thick, opaque, blood-stained, and quite small. Dr. Lockyer congratulated Dr. Blair Bell on securing what he considered to be a rare specimen, and he quite agreed with him in his views as to the manner in which it was shed.

The PRESIDENT (Dr. Amand Routh) had seen a case similar to that mentioned by Dr. Herman, in which a membranous cast of the uterus was regularly passed whilst cohabiting, and ceased during sexual abstinence. He also stated he had seen a uterine cast containing what appeared to be decidual cells in a woman who had aborted three months previously. He asked if it were not possible for decidual cells to be found some months after a previous gestation.

Dr. BLAIR BELL said in reply to Dr. Handfield-Jones that the patient only suffered a moderate degree of pain during menstruation. He believed that severe pain was only caused by 'solid' casts, and that the membranous casts might come away without causing violent expulsive contractions and consequent pain. With regard to the ætiology of the condition, he believed that the separation of the membrane was due to a rather sudden and profuse effusion of blood occurring in and behind the endometrium, in which there was a rather more marked decidual reaction than usual, and this prevented the blood escaping, the result being that the endometrium was stripped off. Dr. Herman said that he remembered several cases in which the patient ceased to pass casts when separated from her husband. Dr. Blair Bell thought that this might easily be explained by the lessened sexual activity during menstruation in such circumstances. With regard to Dr. Lockyer's remarks Dr. Blair Bell pointed out that there was usually a well-marked decidual reaction in the premenstrual stage of menstruation, and he believed it was possible to distinguish between the decidual cells of menstruation and those connected with pregnancy. Further, as he had already pointed out, the glands showed none of the early changes seen in most decidual casts of pregnancy. Since, however, there appeared to be so much difference of opinion he would like to say in conclusion that he had himself removed both tubes and one ovary from this patient over two years ago. He thought, therefore, that in this case the occurrence of a monthly abortion could be excluded.

Bilateral Carcinomatous Sarcoma of the Ovary.¹

By W. BLAIR BELL, M.D.

THESE specimens, consisting of bilateral solid ovarian tumours, together with the uterus, were removed from Mrs. A. K., a young woman, aged 29. Her previous history contains little of importance. Menstruation commenced at 17; cycle $\frac{7-9}{21}$; no pain. She has had one child, two and a quarter years before; no miscarriages; no puerperal trouble except indigestion, which lasted for three months.

Present history: Patient first noticed three months ago that she could not hold her water, and this condition has continued ever since. Menstruation for the last three months has been very scanty, only lasting two days, and it is associated with profuse leucorrhœa. During this time she has noticed the abdomen enlarging. Also for the same period she has been losing weight, and has been getting weaker.

¹ See Report of Pathology Committee, p. 164.

Present condition: Patient looks well nourished, but is slightly anæmic.

Examination *per abdomen*: A definite, large, round tumour can be felt chiefly in the left lumbar and umbilical regions, extending from the umbilicus below to the costal margin above. This tumour is movable in all directions. The anterior edge seems sharp, and reaches nearly to the middle line. The uterus can be felt just below this tumour, the fundus being pushed to the left side by another rounded tumour, which occupies the right iliac fossa, and partly fills the pelvis. This second tumour is also movable.

Examination *per vaginam*: The pouch of Douglas is filled with a large movable tumour which is continuous with the tumour in the right iliac fossa. The cervix is hardly to be felt high up on the left



FIG. 1.

Ovarian tumours and uterus removed at operation. One tumour is cut through and shows a cystic cavity. (Reduced.)

side. Operation was performed on April 24, 1911. There was a small amount of clear fluid in the abdominal cavity. The tumours, which originated from the ovaries, were removed together with the tubes and the whole of the uterus (fig. 1).

After-history: Up to the present date (January 4, 1912) there has been no sign of recurrence, and the patient has gained considerably in weight.

Pathological description of the tumours: The left tumour is the larger, measuring $6\frac{1}{2}$ in. by 4 in.; the right measures 5 in. by $3\frac{1}{2}$ in. Each is hard in consistence, and nodular on the surface. A few cysts are contained in the interiors of both tumours.

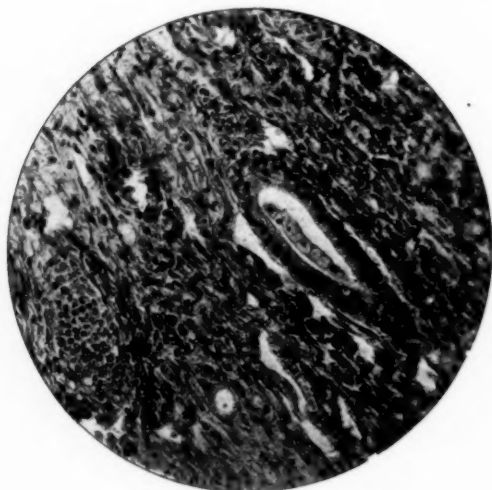


FIG. 2.

Agland-like structure with larger epithelial cells in the interior. ($\times 150$.)

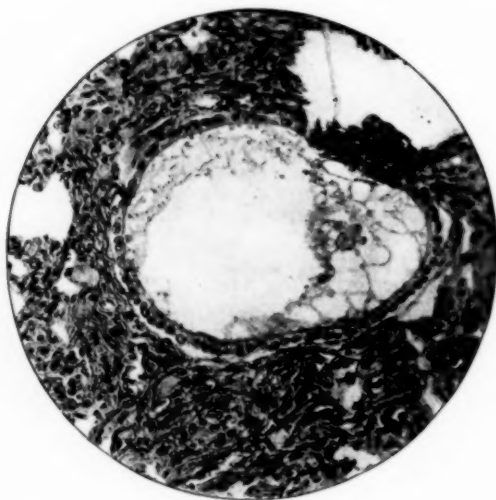


FIG. 3.

Probably a Graafian follicle. ($\times 150$.)

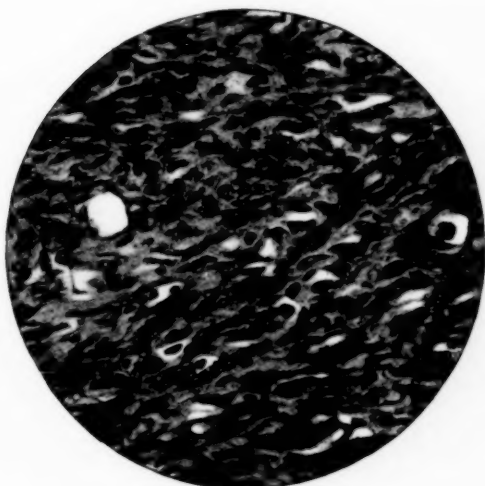


FIG. 4.

Sarcomatous cells. ($\times 250$.)

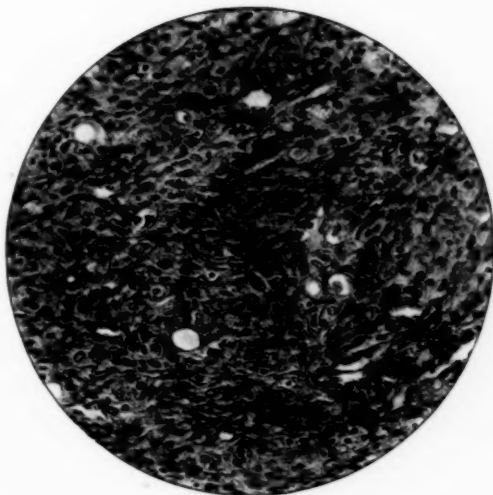


FIG. 5.

The cells in this field seem to be more epithelial in character than in the obviously sarcomatous portions of the tumour. ($\times 150$.)

Microscopically the tumours are seen to be composed of somewhat remarkable cellular elements. Portions of them contain gland-like structures with epithelial cells in the interior (fig. 2). Some of these, which can be seen in all stages of development, appear to be imitations of Graafian follicles. In fig. 3 is seen what really may be a Graafian follicle, or a very good imitation of one. For the most part the stroma is made up of what appear to be sarcomatous elements (fig. 4). In other parts it appears carcinomatous (figs. 5, 6 and 7). In Hanse-mann's Atlas a growth with these characters is figured. He calls it 'carcinoma sarcomatodes.' Parts of the tumours shown to-night exactly represent his figure.

Quite recently, and since we recognized the nature of this tumour, E. K. Cullen has published in the *Johns Hopkins Hospital Bulletin*¹ a somewhat similar case. In this paper are given references to a few cases of carcinoma and sarcoma occurring together in other organs. But, apparently, Hanse-mann's, Cullen's, and this are the only three cases of this form of mixed tumour in the ovary on record, although it is probable that others may have been overlooked. In connexion with this type of growth, the work of Haaland² is extremely interesting, for he shows that subsequent to the transplantation of a slow-growing adeno-carcinoma with a somewhat fibrous stroma, a sarcomatous interstitial tissue has appeared in several separate strains.

Dr. LOCKYER was particularly anxious that Dr. Blair Bell should allow this specimen to be referred to the Pathology Committee. The sections required careful and close study, such as was impossible to be made during the few moments at one's disposal in a society meeting. Dr. Lockyer agreed as to the question of malignancy, but it had to be borne in mind that in every type of malignant growth the cells were often disposed to take on atypical proliferation, and this was markedly seen in many of the carcinomata. In such an important case multiple sections should be made from various parts of the two growths, and carefully studied by the Committee appointed by this Section for such purposes.

¹ Cullen, E. K., *Bulletin, Johns Hopkins Hospital*, Baltimore, 1911, xxii, p. 367.

² Haaland, M., "Contributions to the Study of the Development of Sarcoma under Experimental Conditions," *The Imperial Cancer Research Third Scientific Report*, Lond., p. 175.

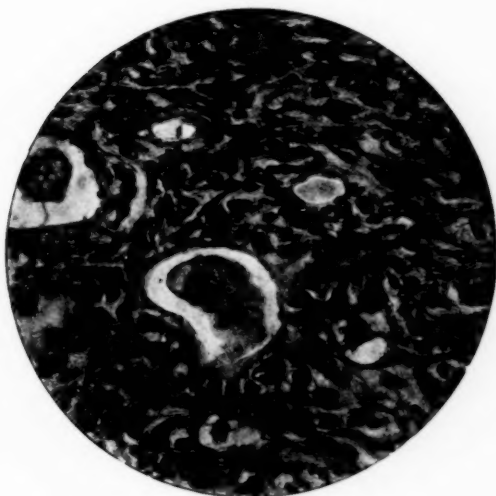


FIG. 6.

A mass of isolated epithelial cells. ($\times 520$.)



FIG. 7.

A mass of isolated epithelial cells. ($\times 520$.)

REPORT OF PATHOLOGY COMMITTEE.

The Pathology Committee met for the second time to discuss Dr. Blair Bell's specimen of carcinomatous sarcomata of both ovaries, and reported as follows:—

"Macroscopically: Both tumours show a dense cortical portion, whitish in colour, surrounding a greyer central area, which has undergone cavitation by mucoid softening.

"Histologically: The sections show the growth to be composed of a uniformly cellular tissue, consisting of fusiform cells with oval and rounded nuclei. In the most part the vessels are fully formed, and have thick walls. There is a vacuolated condition of numerous cells, giving them an epithelioid appearance, and this the Committee regard as degenerative in nature.

"The Committee are of opinion that there is not sufficient evidence that there is carcinoma in the tumour, and they regard it as either an actively growing fibroma or a fibroma becoming sarcomatous. The Committee, however, wish to state that the richly cellular structure of the tumour is in their experience quite exceptional for a fibroma."

This report was signed by all the members of the Committee present, except Dr. Blair Bell, who adhered to the opinion expressed in his paper.

A Case of Rhabdo-myosarcoma of the Uterus.

By W. BLAIR BELL, M.D.

Miss L. C., aged 70, had the menopause twenty years ago, and remained quite well until July, 1911, when she noticed a slight reddish discharge from the vagina; this was not offensive then, but became so later. On September 15 she passed a large piece of growth which was found, on histological examination, to be a mixed-celled sarcoma. The uterus, tubes and ovaries were removed a few days later, and the patient made a good recovery. Ten weeks later she was suffering from intestinal obstruction and the abdomen was found to be full of growth. Enterostomy was performed, and the patient lived for about a week. The specimen removed at operation consisted of the uterus, tubes and ovaries; and the uterine cavity was found to contain a large polypoid growth round which the wall of the uterus was stretched. On full histological investigation the tumour proved to be a mixed-celled

sarcoma in which there are a large number of broad spindle cells, and some of these are striated muscle-cells of a somewhat embryonic type. The recurrent growth in the abdomen was also found to be a mixed-celled sarcoma. The case will be published in detail at a future date.

Two Cases of "Missed Labour."

By W. C. SWAYNE, M.D.

SPIEGELBERG¹ defines "Missed Labour" as being the occurrence of the nîsus of parturition at or about the normal term of pregnancy, with the subsequent evacuation either by Nature or Art of the dead or decomposed fœtus; and remarks that, if rupture of the membranes has taken place, the decomposition of the fœtus is, as one would expect, extremely likely. The description of this condition is based on a case described by Oldham² in 1847. The period of retention of the fœtus varies considerably. Hagmann³ describes a case in which delivery by Cæsarean section was necessary, the fœtus being retained in the uterus for four hundred and forty days after the last menstruation, say five months after term. Goldenstein⁴ also describes a case in which the fœtus was apparently retained for three months, and was delivered by dilatation of the cervix. This condition is not very common, but Hagmann, in 1904, had collected fifteen cases. The dangers of the condition are chiefly due to the results of the absorption of toxins from the decomposed uterine contents.

CASE I.

Multipara, aged 33. Previous pregnancies: One full time, two premature labours at seven months. Last pregnancy, January, 1902; last menstruation, October 15, 1904. Patient dated her pregnancy from October 15, 1904, and expected her confinement on September 24, 1905. On June 10, 1905, she had a flooding, and on June 24 the liquor amnii was discharged. Labour pains began, and a mass was

¹ "Midwifery," i, p. 30.

² *Guy's Hosp. Rep.*, Lond., 1847, 2nd ser., v, pp. 105-112; *Trans. Path. Soc. Lond.* (1846), 1847, i, p. 130.

³ *Monatschr. f. Geb. u. Gyn.*, Berl., 1903, xvii, p. 808; *Centralbl. f. Gyn.*, Leipz., 1904, xxviii, p. 267.

⁴ *Centralbl. f. Gyn.*, 1904, xxviii, p. 826.

expelled which the midwife who attended her recognized as the placenta. She ligatured and cut the cord, and called in a doctor, who confirmed her diagnosis. No further phenomena, except an offensive purulent discharge, occurred until August 8, 1905, when a substance was discharged which proved to be a toe; whereupon she came to the Bristol Royal Infirmary.

On admission a foul discharge, which had lasted for four weeks, was found to be present. Her general condition was extremely bad; she was in a semi-comatose condition. Pulse 132, very weak and small; temperature, 99.8° F. On abdominal examination a tumour was found equal in size to a six months' pregnancy, dull on percussion, not fluctuating; very hard, and containing numerous nodules and lumps, apparently of bone. Bony crepitation was felt on pressure on the right side, but the position of the foetus (?) could not be ascertained.

On vaginal examination much very offensive discharge. In the left posterior fornix there was felt a hard, immovable mass about the size of an orange, apparently composed of bone. The os uteri was closed, looked downwards and backwards; cervix normal. The abdominal swelling on bimanual examination proved to be an enlarged uterus, the fundus reaching to the umbilicus. It was not fixed. Diagnosis: Missed labour with decomposition of the foetus.

Treatment: The uterus was washed out with weak lysol through a Bozemann's tube, which struck a hard mass on passing into the uterine cavity. A piece of tissue looking like adipocere was expelled. Through the os bone could easily be felt with the finger. On August 17 her condition was much the same. Ether was administered, and the cervix pulled down with vulsella. The tissue of the vagina and cervix was extremely oedematous and rotten, and it was most difficult to get a firm grip of the cervix, as the tissue tore like wet blotting-paper, directly any pressure or traction was applied. After considerable difficulty the cervix was dilated by Hegar's and Bossi's dilators, until sufficient room was obtained to commence the extraction of the inter-uterine contents. The long bones and ribs were removed with lithotomy forceps and during removal a sharp point of the fibula perforated the bladder and caused an escape of urine. Further dilatation was secured by means of Bossi's dilator. The skull-bones and a stinking mass of skin and bone was removed. The uterus was washed out, swabbed with tincture of iodine, and packed with iodoform gauze, and a laceration of the perineum sutured. The patient stood the operative procedure very badly, and at the completion of the evacuation was almost pulseless. Saline trans-

fusion was performed, and the patient put back to bed. Continuous subcutaneous saline transfusion was then carried out, brandy administered, and the bed raised at the foot; after which the pulse improved considerably, and she became conscious. Sudden collapse, however, occurred a few hours later and she died at 5 p.m.

CASE II.

On September 17, I was called to see a patient who had engaged me to attend her in her confinement which was expected about that date. Her last menstruation occurred on December 17, 1896. Slight pains and weak uterine contractions were present, but no dilatation of the cervix. On seeing her again the next day, the pains had passed off, and there were no further manifestations of labour. I was sent for again in the night of November 30, 1897. The os was dilating, labour pains strong, membranes not yet ruptured. The foetal heart was heard, and foetal movements felt. From the size of the abdomen, and the feel of the foetus, it was obviously impossible for the foetal head to pass through the pelvis, although the latter was normal in size, and she had previously had several children at full term without great difficulty. It was obvious that delivery could not be effected *per vias naturales* except after reduction of the size of the foetus, and to cut the story short, perforation of the head, washing out the brain, and evisceration of the abdominal contents were necessary; the foetus after this weighing 14½ lb. Delivery occurred three hundred and forty days after the last menstruation.

The second case in some ways does not conform exactly to Spiegelberg's definition, for although the nismus of parturition occurred, natural delivery did not occur; but when labour actually did come on, the foetus being alive, the completion of delivery necessitated operative measures.

DISCUSSION.

Dr. HERMAN said that the subject of "missed labour" had been very fully discussed by Dr. Robert Barnes, in a paper read before the Obstetrical Society of London, and published in vol. xxiii of its *Transactions*.¹ The opinion which he (Dr. Herman) had formed after hearing that paper and the discussion upon it was that by the term "missed labour" three clinical events were denoted: (a) Intra-uterine death of the child, and retention of the dead child *in utero* beyond the natural term of pregnancy. Robert Barnes in the paper

¹ *Trans. Obst. Soc. Lond.* (1881), 1882, xxiii, p. 81.

referred to had shown that this might happen at any period of pregnancy; and the dead child might be retained an indefinite time *in utero*. (b) Some people thought that in a healthy pregnancy with a living child labour might begin at the proper time, and then not be completed, the child subsequently dying, and being retained *in utero*. He (Dr. Herman) did not believe that any such thing had ever occurred. (c) Delivery might be opposed by some insuperable obstacle, and the child might in consequence be retained *in utero*. He had seen one such case, and read of another. He saw in 1886 a patient, then aged 37, who had suffered for twelve years from uterine tumours, believed by him and by those who had seen her—among them Dr. Robert Barnes, Dr. Graily Hewitt and Sir Spencer Wells—to be uterine fibroids. Her last menstruation was in the first week in June, 1886. She was constantly sick. There was in August a nodular tumour reaching two-thirds of the distance between the umbilicus and the ensiform cartilage. The girth at the umbilicus was $33\frac{1}{2}$ in. On October 23 the girth was $35\frac{1}{2}$ in.; on December 2 it was 36 in., and the foetal heart was audible. About this time she saw Sir Spencer Wells, who wrote to Dr. Herman to the effect that he had no doubt about the pregnancy. The breasts were secreting. On December 18 she had a rigor; and she supposed that the child then died. On August 23, 1887, the girth at the umbilicus was 33 in. Dr. Herman next saw her on March 13, 1891. She had then been passing bits of bone by the vagina since October, 1889. The passage of the bones was preceded by a few days of illness: and there was constant discharge, variable in amount. There was no pain or functional disturbance either of bladder or rectum. He examined the vagina both digitally and with the speculum, and could perceive no opening into it, except the natural one of the cervical canal. The patient was a very intelligent and well-informed person, who knew enough anatomy to understand what the term "*os uteri*" meant, and she was positive that the bones issued from the *os uteri*, and from nowhere else. The tumour now reached one-third of the distance between the umbilicus and the ensiform cartilage. Except for the illnesses preceding the escape of pieces of bone the patient had been, and appeared to be, in excellent health. He had since had communications from the patient, enclosing further pieces of bone, but had not heard from her now for some years. He had not before published any record of this case, for he had hoped that he might be able to make the record complete; but it seemed unlikely that he would ever be able to do so. The case that he had read of was published by Dr. P. R. Menzies in the *Glasgow Medical Journal*.¹ In that case the *os uteri* was blocked by a mass of cancer of cartilaginous hardness, and the patient died undelivered in the seventeenth month of her pregnancy.

Dr. SWAYNE, in reply, said that in the second case the patient would undoubtedly nowadays have been treated by Cæsarean section, but at that date (1897) Cæsarean section was decidedly an uncommon operation in the West of England, and the circumstances of the patient were unfavourable to its performance.

¹ *Glasg. Med. Journ.*, 1853, i, p. 129.

A Case of (?) Chorionepithelioma.

By J. B. BANISTER, M.D.

THE patient was under the care of Dr. Amand Routh at Charing Cross Hospital, and it is by his courtesy that the sections are now shown. She was a married woman, aged 47, and had had three children, the last pregnancy being eight years ago. She had had no miscarriages.

Up to December, 1910, she was quite well, but then began to complain of attacks of pain in the left iliac region. The pain was of a deep-seated nature and was at first intermittent in character, occurring at intervals of about a fortnight. It was said to resemble a straining effort. These attacks have become gradually more frequent. They are increased by any prolonged standing, and lying down is followed by comparative ease. At the time of admission to hospital the pain was almost continuous. It has never radiated down the legs.

In January, 1911, she began to complain of dyspareunia, which rapidly became so marked that in April marital relations were discontinued and have not been resumed. In May frequency of micturition was noticed and this has gradually increased, though there has never been either pain or difficulty associated with the act. During August streaks of blood were often noticed in the urine. For two or three months there has been slight leucorrhœa, but this has only been noticed for a few days after the periods until September, when the discharge became more profuse, of a watery consistency, pinkish-yellow in colour, and very offensive.

Menstruation began at the age of 13, was normal in every way up till June, 1911, when the period was much in excess of the normal and accompanied by an unusual amount of pain. The July period was similar, and the August one was more pronounced still. The pain was extreme and was said to be like the pain in the iliac region of which she had previously complained. The loss lasted eighteen days and was described as "flooding all the time." Many large clots were passed. The loss was not offensive. Following this loss was the discharge above mentioned.

Her general condition became bad. She complained of attacks of faintness and nausea and came up to hospital on September 13. On examination, a brick-red tumour with superficial sloughing areas was

found occupying the dilated external os. It was rather hard, but did not bleed, nor did it break down easily. The finger could be passed completely round it and it was recognized to be stretching the cervical canal. Its attachment could not be felt with certainty owing to the pain caused by the examination. It was taken to be a sloughing fibroid polyp and the patient was admitted to hospital on September 17.

On September 19 Dr. Routh operated, and his note, dictated at the time, was as follows: "The cervix shows some ulceration around the margin of the external os and on the anterior wall of the canal, the wall being ragged and friable. A friable growth protrudes into the endo-

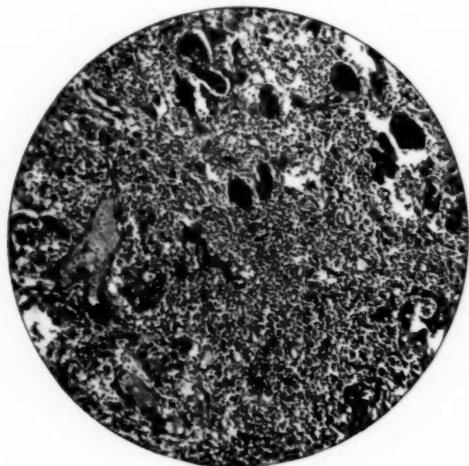


FIG. 1.

Under low power, showing areas of syncytial-like cells.

cervix from the right side and in front, arising from about the level of the internal os."

On attempting to define the limits of the growth it was found to have extensively infiltrated the bladder wall and complete removal was deemed impossible. As much as possible of the base was therefore scraped away and the cavity packed.

Only a few pieces of any size were obtained and from these sections were taken. They show an unusual type of tumour, and it is in order to obtain the opinions of members of the Section, and especially, if possible, of the Pathology Committee, that they are brought forward to-night.

The PRESIDENT said that when he examined the patient under anæsthesia he found that the cervix had been almost destroyed by malignant ulceration, the bladder wall being infiltrated with growth, so that even a Wertheim operation was inadmissible. When he heard that there was a possibility that the growth was a chorionepithelioma he had the patient brought again to the hospital, thinking that most of the growth might be removed and possibly what was left might become cured, as has happened to metastatic growths in some recorded cases. The case, however, was found to be surgically hopeless, and he had transferred her to the Radium Institute, where she had had several prolonged exposures to the rays of a radium tube inserted in the crater cavity of the cervix uteri during the last ten days.

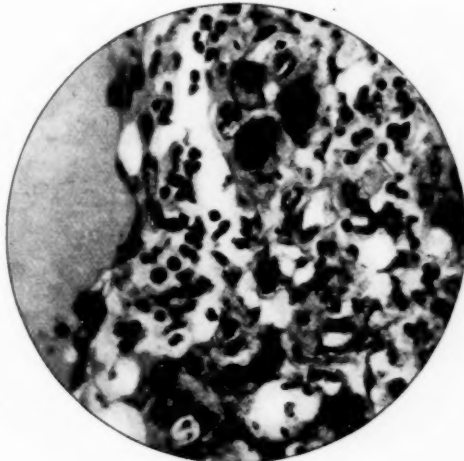


FIG. 2.

Some of the masses under high power.

REPORT OF PATHOLOGY COMMITTEE.

"The Committee report that in their opinion the growth is a squamous-celled carcinoma with numerous large cell fusions, some of which are undergoing keratoid changes. There is a marked absence of extravasated blood throughout the section."

**On the Relative Size of the Uterus in Cases of Hydatid Mole,
with Illustrative Cases and Specimens.**

By HENRY BRIGGS, F.R.C.S.

THE assertion that undersize, and not oversize, of the uterus is the more prevalent disproportion in cases of hydatid mole, if sustained, modifies the current statements concerning this physical feature. To promote and to support the assertion are the main purposes of this communication, which has been founded upon eighteen years' clinical observation of cases chiefly from the author's own practice and upon the specimens and photographs, now produced, from the Laboratory of Obstetrics and Gynæcology in the University of Liverpool.

The cases have been arranged in four groups; in the three groups A, B and C according to the relative size of the uterus when first examined, and in the group D the cases of hydatid mole with chorio-epithelioma.

SIZE OF THE UTERUS.					
Group A	Proportionate ...	...	...	...	1 case
" B	Disproportionate, undersize	...	...	...	16 cases
" C	" oversize	...	...	...	4 cases
" D	" chorioepithelioma	...	...	...	2 cases { one undersized one oversized

INTRODUCTION TO GROUP A.

At the completion of the three months' gestation history, on April 3, 1911, when the patient was first seen, examined, and admitted from the hospital out-patients, the normal size of the uterus was not the only local physical feature observed; abnormal uterine tension was also noted. The latter is important because at that time a twenty-one days' daily blood loss had persisted and the abnormal uterine tension was not inconsistent with concealed hæmorrhage. During the subsequent seventeen days' total rest in bed in hospital, the daily external blood loss continued; the uterus gained in tension and in size; in seventeen days one month's enlargement had proceeded at twice the rate of a normal pregnancy.

From a proportionate uterus on April 3, a disproportionate uterus developed between April 3 and April 20, with abnormal tension throughout.

Disproportion reigns as a rule during the course of cases of hydatid mole; consequently a uterus of normal, or proportionate, size has been a rare discovery, attributable specially to the rarity of the opportunity and not solely to the rarity of the occurrence—i.e., if undersize precedes oversize.

This solitary observation of a uterus of proportionate size, *but* of abnormal tension, cannot be accepted without prominent recognition that the abnormal tension was ample evidence of the oft-repeated, or continuous, accessions to the intra-uterine retained blood, without *which*, as the whole specimen shows, the uterus would have been undersized and of lower tension—i.e., of soft and boggy consistence.

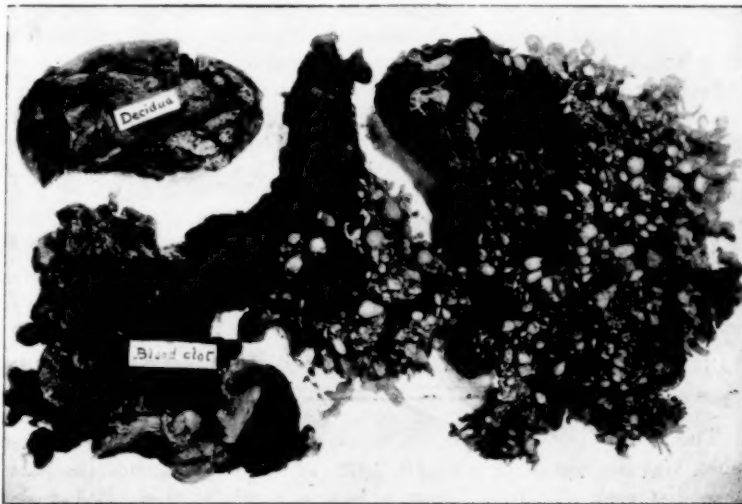


FIG. 1.

Group A, Case I. Decidua, blood-clot, and hydatid mole.

The photograph (fig. 1) of the whole uterine contents shows (1) the complete decidua; (2) the firm blood-clot partly separate from and partly incorporate with (3) the mole, well formed and vesicular throughout. The firm blood-clot approximately contributed a little more than one-half of the whole uterine contents. The clinical record is by no means characteristic of hydatid mole; similar intra-uterine blood retention, with its local physical effects on the tension and size of the uterus, may precede and attend an abortion.

174 Briggs: *Relative Size of Uterus in Cases of Hydatid Mole*

GROUP A—UTERUS OF PROPORTIONATE SIZE—ONE CASE.

Case I.—The size of the uterus (temporarily, i.e., when first observed) proportionate to the period of pregnancy—3 months : 3 months (under observation, increasing in seventeen days to four months).

Hydatid mole: The combined weight of the mole and of the firm blood-clot, 1 lb. 1 oz.

A. F., aged 26; nine years married; six pregnancies; three children (the third born in September, 1909) and three abortions (the last one three years ago). Menses regular (four to five days every twenty-eight days).

The molar pregnancy dated from the first week in January, 1911. Its history: Vomiting; impaired general health; bearing-down pain and a daily loss of blood of a dark brown colour during the final three of the twelve weeks' pregnancy. The patient was admitted into the Hospital for Women on April 3, 1911. Its physical signs: On admission, the size of the uterus was not inconsistent with a normal gestation; the tension of the uterus was abnormally high.

Between April 3 and April 20 a more rapid increase in the size and the tension of the uterus was observed and ascribed to further intra-uterine hæmorrhage and blood retention. Its treatment: On April 20 a No. 9 gum-elastic bougie was placed *in utero*. On April 23, after sixty-four hours, the expulsion of the uterine mole and the blood-clot was completed. The mole was fœtid.

After-progress: On the first day the temperature rose rapidly to 105° F., and the pulse to 160; both equally quickly became normal in the otherwise undisturbed convalescence.

INTRODUCTION TO GROUP B—UTERUS UNDERSIZED—SIXTEEN CASES.

The first object-lesson in undersize, at the time regarded as exceptional, was the result, on July 18, 1893, of the treatment of the patient (Case I, Group B) from whose uterus a perfectly developed hydatid mole was expelled fifteen days beyond the calculated full term in response to the action of intra-uterine bougies. In this instance the quiescent five and a half months' uterus had been observed for over one and a half of the later months of gestation.

Out of a total of twenty-three cases, this group of sixteen, in which undersize of the uterus was recorded, demands a due appreciation of this feature in the clinical history of hydatid moles. The variable duration of the gestation history of each is stated:—

In nine cases, from the full term to seven months.

In four cases, from six and a half months to five months.

In three cases, from four and a half to three months.

Frequent quiescence—Cases I, II, IV, V, VI, VII, IX, XI—and occasional recedence—Cases III, X, XV¹—accord with the accuracy of most writers in their description of the consistence of the uterus as softer and more boggy than normal. Five bimanual examinations at long intervals clinically confirmed the continuous undersize of the uterus in Case XII. The remaining moles—Cases VIII, XIII, XIV and XVI—were proportionately small. The largest mole in the group was from Case VIII; it was unequal in size to the seven and a half months' history.

In the majority—nine cases—there was ample time for activity during the untreated stages of their long course to the seventh month and upwards. In the minority—seven cases, i.e., in the three cases under four and a half months and in the four cases under six and a half months—any possible future progress from undersize to oversize was checked, either spontaneously or by treatment. As observed and reported, sixteen cases of hydatid mole were characterized by an undersized uterus, both when first examined and when spontaneously relieved or radically treated.

These cases and specimens, now collectively produced for publication, are adequate grounds for an attempted affirmation that uterine undersize is the more frequent disproportion.

GROUP B—UTERUS UNDERSIZED—SIXTEEN CASES.

Case I (fig. 2).—Disproportionate, fifteen days beyond the full term; undersized, five and a half months' uterus. This exceptionally complete hydatid mole when expelled afforded an object-lesson on uterine quiescence and undersize. On July 18, 1893, the five and a half months' uterus, loaded with a soft solid, was known by Dr. Joseph Matthews, of Blundellsands, to have been stationary in size for one and a half months.

Hydatid mole: Weight, 20 oz.; dimensions, 6½ in. by 5½ in. by 3 in.; expelled on July 18, 1893, fifteen days after the calculated full term of pregnancy, July 3, 1893, and seven and a half hours after four bougies had been placed *in utero*. The decidual envelope is exceptionally intact; here and there are one or more molar vesicles bared by perforation or by thinning and laceration; abundant grapelike vesicles fill the decidual cavity; the amnion is visible in patches detached from the chorion; there is no trace of a fœtus.

Mrs. B., aged 32; one child.

The molar pregnancy dated from September 26, 1892. Its history: In consequence of a slight hæmorrhage on May 26, 1893, an examination was

¹ The grooved peritoneum observed during the ovariectomy for a large cystadenomatous tumour in Case XV was ocular proof of intra-uterine shrinkage or recedence.

176 Briggs: *Relative Size of Uterus in Cases of Hydatid Mole*

made; a small clot was found in the vagina; the uterus was then below size as a five and a half months' gestation with a seven months' history. After three weeks' rest in bed the hæmorrhage ceased. The full term of pregnancy was due on July 3. The bleeding recurred on July 12 to July 18, nine to fifteen days beyond the expected full term of pregnancy. Its physical signs: The fundus uteri reached, at the end of May, as far as the lower margin of the umbilicus, and remained at the same level till July 18.



FIG. 2.

Group B, Case I. An exceptionally intact hydatid mole.

Treatment: Four gum-elastic bougies, 10, 11, 12 and 13, English scale, were placed *in utero* on July 18, 1893; seven and a half hours later the molar mass' was expelled entire. Convalescence was uncomplicated.

After-history: Three healthy children have been born since the molar gestation: (1) 11 years; (2) 9½ years; (3) 6 years of age. Report on December 12, 1905. Further report: The patient herself in good health, October, 1911.

Case II (fig. 3).—Disproportionate, full term; undersized, three and a half months' uterus. The specimen is similar to that of Case I, but a less fully developed hydatid mole (presented by Dr. Edis, June 24, 1908).



Group B, Case II. Molar vesicles widely distributed.

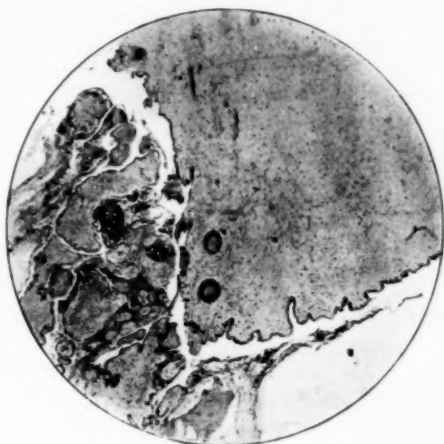


FIG. 3.

Group B, Case II. Villi and fibrin in section from portion of mole marked +.

178 Briggs: *Relative Size of Uterus in Cases of Hydatid Mole*

Mrs. —, aged 30; ten years married; three abortions; three children, one stillborn; the youngest child is alive and 14 months old.

The molar pregnancy ended spontaneously at the full term. Its history: No hæmorrhage; a little pain in the lower abdomen was the only symptom. The mole weighed $5\frac{1}{2}$ oz. and measured 3 in. by 5 in.; well-formed chorionic vesicles were found distributed here and there throughout the chorion; the amnion was preserved.

Case III (fig. 4).—Disproportionate, over nine months; undersized, ten weeks' uterus. The hydatid mole of small size, retained until digitally removed beyond the full term, illustrates uterine quiescence and uterine recedence in a case of hydatid mole. The mole itself was not preserved. A photomicrograph shows its structure.

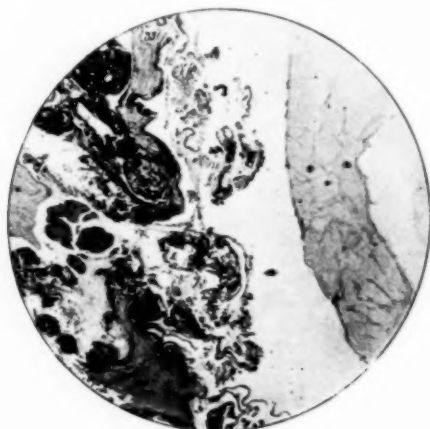


FIG. 4.

Group B, Case III.

E. C., aged 24; six years married; three children, the youngest aged 3. Regular menstruation until July, 1902.

The molar pregnancy—its history: After two menstrual periods (August and September, 1902) had been omitted, there commenced and persisted, with intermissions of fourteen days to one day, for seven months, a slight loss of blood of a dark brown colour with frequent small clots. Its physical signs: In January, 1903, after four months' hæmorrhage, she was examined and reported to be pregnant at an early stage. She thought her pregnancy receded; she had slight lumbar pains and a sense of weight in the lower abdomen. On May 14, 1903, beyond the nine months (two of suppression and seven of bleeding), a general anæmia from the total blood losses had developed. The patient was



Group B, Case IV. Widely distributed vesicles.

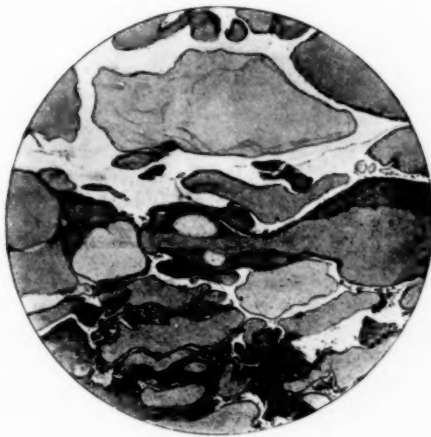


FIG. 5.

Group B, Case IV. Villi and fibrin.

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examined at 2 p.m., and her uterus was said to be subinvolved; the same night the hæmorrhage increased.

Treatment: On May 20, 1903, Dr. A. St. John Wright asked Dr. Briggs to see her; the cervix was dilated by metal dilators and the small hydatid mole was digitally removed from a uterus judged to be ten weeks in size with a nine months' history.

After-progress: Since the molar pregnancy she has borne four children; of these the first was born eleven months after the removal of the hydatid mole. In June, 1911, her ninth pregnancy had reached the fifth month; she was in good health.

Case IV (fig. 5).—Disproportionate, thirty-eight weeks and three days menstrual suppression; undersized, three and a half months' uterus.

Hydatid mole: Weight, 3 oz.

M. R., aged 25; seven years married; three children, the youngest aged 2 years and 8 months. Menses: Formerly four days every four to six weeks.

The molar pregnancy dated from the cessation of her last menstruation on July 3, 1910. Its history: Her general health was not impaired: she applied at the Hospital for Women as an out-patient because of a thirty-eight weeks and three days' menstrual suppression. Its physical signs on admission, March 29, 1911: (1) The cervix and the body of the uterus were both firmer than normal; (2) the latter was enlarged to three and a half months.

Treatment: Next day a No. 8 shortened male gum-elastic bougie was passed into the uterus; at the end of thirty hours the mole was expelled.

Case V (fig. 6).—Disproportionate, eight calendar months: undersized, four and a half months' uterus.

The hydatid mole is a well-formed compact mass; weight, $5\frac{1}{2}$ oz.; dimensions $4\frac{1}{4}$ in. by $3\frac{1}{4}$ in. by $1\frac{5}{8}$ in.; expelled nineteen days after an ovariectomy for a large cystadenoma of the right ovary.

A. B., aged 29; twelve years married; six children, the youngest child aged 2; no abortions.

The molar pregnancy covered an eight months' menstrual suppression. Its history: The vomiting had been more severe than during any previous pregnancy; she had throughout a bearing-down pain in the lower abdomen. There was a large ovarian cystadenoma and a history of pain in the right groin. Its physical signs: a four and a half months' uterus lying underneath the large ovarian cystic tumour; the combined abdominal enlargement was equal to that of a seven and a half months' pregnancy.

Treatment (March 5, 1901): Ovariectomy for the tumour of the right ovary, the left ovary was normal. The expulsion of the mole on March 24, after a slight hæmorrhage daily for one week, occurred during the convalescence from the ovariectomy.



Group B, Case V. An intact hydatid mole.



FIG. 6.

Group B, Case V. Fibrin and villi.

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Case VI (fig. 7).—Disproportionate, eight calendar months; undersized, four and a half months' uterus.

Hydatid mole: Weight, 11 oz.

L. C., aged 27; nine years married; four children, the youngest aged 2. The patient was a thin, spare woman in good health.

The molar pregnancy dated from eight months before her admission into the Hospital for Women, on March 4, 1902. Its history: The patient thought she was pregnant. There was morning sickness in the early months; from the

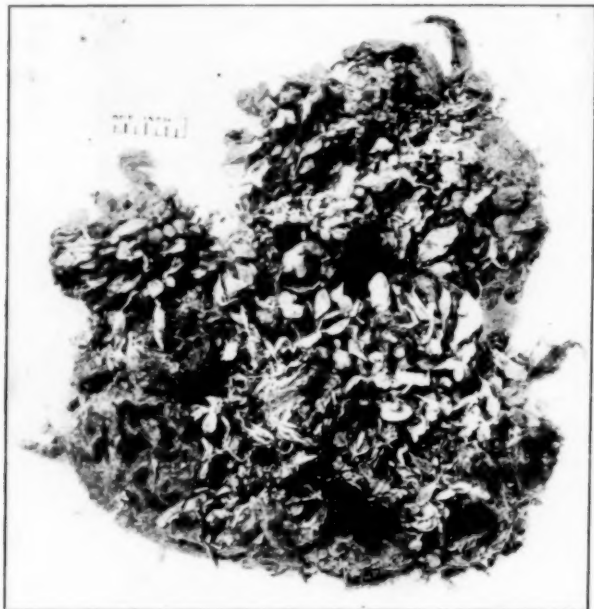


FIG. 7.

Group B, Case VI.

third month onwards she repeatedly observed a brown vaginal discharge of brief duration after strain or exertion. Its physical signs: The uterus was the size of a four and a half months' pregnancy; its consistence was soft and flabby.

Treatment: The mole was expelled thirty-six hours after three shortened gum-elastic bougies had been lodged within the uterus.

Case VII.—Disproportionate, thirty-three and a half weeks; undersized, ten weeks' uterus.

Hydatid mole: Weight, $2\frac{1}{2}$ oz.; dimensions, $1\frac{1}{8}$ in. by $1\frac{3}{8}$ in. by $3\frac{3}{8}$ in.

Mrs. W., aged 32; seven years married; two children—(1) instrumental; (2) normal labour. Menses: One to two days every twenty-eight days. Previous history: After her second confinement she was in bed three months with "inflammation of the womb and abscesses of both breasts."

The molar pregnancy dated from the cessation of the last day of menstruation on July 18, 1903. Its history: Morning sickness continued until the end of October. At the end of October, after a drive in a dog-cart to the station to meet a friend, she fainted on her return home and remained unconscious for a brief period. She regained consciousness and went to bed. Thereafter she stated the morning sickness ceased and her abdomen did not increase in size.

Treatment: She was referred by Dr. O'Connor, of St. Anne's-on-the-Sea, at the end of thirty-three and a half weeks, on March 8, 1904, to Dr. Briggs, who emptied the ten weeks' uterus of the hydatid mole.

After-history: A healthy living child was born on September 16, 1906; the patient is in good health in August, 1911.

Case VIII.—Disproportionate, seven and a half calendar months; undersized, six months.

Hydatid mole: Weight, 2 lb. 14 oz.

Mrs. B., aged 27. No abortions; four full-term children; the last child born November 15, 1908.

The molar pregnancy dated from November 30, 1909, the last of a three days' natural menstruation. Its history: Dark blood-stained discharge occurred daily, and an occasional clot from March 31, 1910, the end of the fourth month onwards. Its physical signs: At the end of the seventh month, in June, the midwife reported a six months' uterus.

Treatment: July 15, 1910, spontaneous expulsion of the large molar mass; the patient on July 16 was sent into hospital, as a few molar vesicles and blood-clots had been found in the vulval dressings; in hospital the uterus was manually emptied and found to contain only small, loose masses of blood-clot and very few vesicles.

After-history: June 14, 1911, the patient is in good health; she has since borne one child.

Case IX (fig. 8).—Disproportionate, seven months; undersized, three months' uterus.

The hydatid mole is a complete one. Weight, 2 $\frac{3}{4}$ oz.

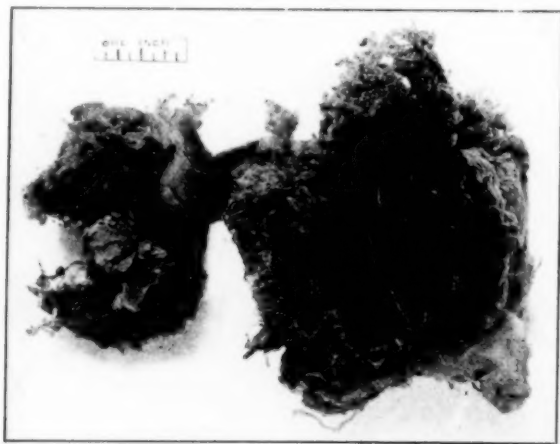
Mrs. L., aged 47; seven healthy full-term children; no abortions, youngest child aged 7.

The molar pregnancy dated from seven months previously. Its history: Pains about the waist and in the epigastrium; headache; nervousness and irritability; a feeling of illness; she had no thought of pregnancy, but of the change of life. Its physical signs: Dr. Wright examined her and found a three months' uterus and the urine highly albuminous.

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Treatment: She did not improve; she had one eclamptic convulsion; the mole was expelled spontaneously on July 16, 1907.

After-progress: She regained perfect health, never again menstruated, and is now quite well (October, 1911).



Group B, Case IX. A complete hydatid mole.

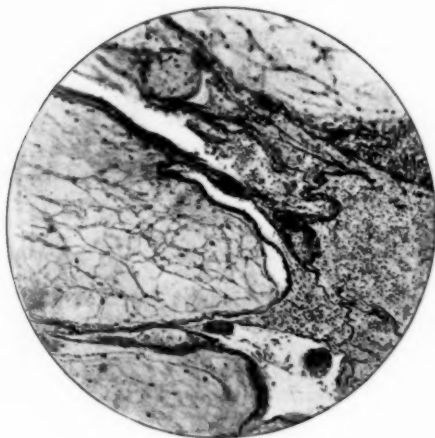


FIG. 8.

Group B, Case IX. Villi and blood.

Case X.—Disproportionate, six and a half months; undersized, four to five months' uterus; recedence noted. (Notes by Dr. Irvin Sellers, of Preston.)

Mrs. X., aged 49; ten children; two abortions; one miscarriage at six and a half months.

The molar pregnancy dated from September, 1910. Its history: At the age of 49 the patient believed she was not pregnant; she felt irritable and nervous; a daily hæmorrhage set in early in the fourth month and she was in bed for twelve weeks. Its physical signs: Early in the fourth month, when the bleeding commenced, the disproportionate undersize was less striking than at the fifth month onwards.

Treatment: At six and a half months a bougie was placed *in utero* and the mole was expelled two days later.

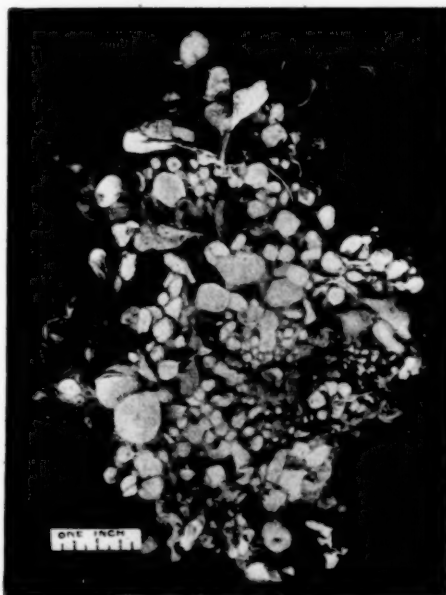


FIG. 9.

Group B, Case XI. A quiescent hydatid mole.

Case XI (fig. 9).—Disproportionate, five months; undersized, eleven weeks, from the size of mole.

Hydatid mole: Weight, $3\frac{1}{4}$ oz. The grape-like vesicles of variable size are abundant. In a firm blood-clot a portion of the mole was embedded. There was no trace of a fœtus. The specimen was presented in 1901 by Dr. Philip Nelson, who reported that the first hæmorrhage occurred and preceded the spontaneous expulsion of the mole at the end of the fifth month. The hæmorrhage was severe.

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Case XII.—Disproportionate, five calendar months; undersized, three and half months' uterus.

A hydatid mole: Its clinical course was scrutinized on five occasions; on each bimanual examination the uterus was undersized.

Mrs. R. L., aged 23; married on December 5, 1901.

The molar pregnancy dated from the last of a three days' menstruation on December 15, 1901. Its history: From the end of a six weeks' menstrual suppression onwards there occurred irregular and intermittent blood losses. Its physical signs: On March 23, in the fourteenth week, the uterus was only the size of a two months' gestation.

Treatment: For the hæmorrhage she remained at rest. On May 21 the mole was spontaneously expelled; in the meantime the uterus continued to enlarge, but throughout was relatively undersized.

After-history: For irregular uterine hæmorrhage the uterus was curetted on January 8, 1902. The first subsequent pregnancy terminated in the birth of a healthy female child at the full term in 1905. There have been four healthy children since born.

Case XIII.—Disproportionate, twenty-two weeks; undersized, nineteen weeks' uterus.

Hydatid mole: Weight, $4\frac{3}{4}$ oz.; dimensions, $5\frac{7}{8}$ in. by $2\frac{7}{8}$ in. by $1\frac{1}{2}$ in.

F. E. J., aged 32; eight months married; the wife of a labourer at the Cold Storage Depot. Menses: Two days in every twenty-eight days; date of marriage, January 23, 1904; the usual period occurred on February 6, fourteen days overdue, and ceased on February 8; the next period was similarly delayed till March 22, and ceased on March 24.

The molar pregnancy dated from March 24. Its history: Discomfort in lower abdomen; morning sickness; after two months' menstrual suppression, near the end of May, a blood loss commenced and continued until after the hydatid mole was manually removed through the naturally dilated cervix on August 26, 1904, exactly at the end of the twenty-second week of gestation. Its physical signs: On admission, August 25, the uterus was enlarged, its fundus exactly three fingers' breadth below the lower margin of the umbilicus; the cervix was dilated and through it hydatid vesicles and blood-clot were withdrawn by the examining finger.

Treatment: Manual separation and extraction of the molar mass.

After-progress: Her general condition was fair; on admission the temperature was 99.4° F., and after the uterus was emptied, 101° F., and subsequently normal. When she left the hospital on September 7, there was a faint reddish discharge from the uterus.

After-history: December 11, 1905, in good health; no subsequent pregnancy.

Case XIV (fig. 10).—Disproportionate, eighteen weeks; undersized, twelve weeks' uterus.

A small hydatid mole: Weight, 2 oz.; dimensions, 3 in. by $1\frac{1}{2}$ in. by $1\frac{1}{4}$ in.

The ovoid mole of small size has retained its decidual covering; externally, minute vesicular perforations are observable on the decidua and through a vertical tear in one of its quadrants thirty molar vesicles are hanging by their stalks. By microscopical examination hæmorrhages were found outside the chorion within the decidua.

Mrs. W., aged 26; four years married; two children. A good recovery followed her first confinement. After her second confinement (May 26, 1900) she went for a carriage drive on the fifteenth day; on the following day there was considerable uterine hæmorrhage; subinvolution; subsequently general weakness; still later, persistent leucorrhœa and endometritis; both were



FIG. 10.

Group B. Case XIV. A perfect and undersized hydatid mole.

treated. Menstruation (afterwards regular) four to five days in every twenty-one days, painful, and marked by clots.

The molar pregnancy dated from the cessation of the last period on December 7, 1900. Its history: On April 17, 1901, after eighteen weeks of gestation, the patient reported a vaginal discharge, at first watery, then pale red; there were also headache, insomnia, palpitation and vomiting. Its physical signs: The uterus, the size of a three months' pregnancy, was more firm in texture. The cervix showed glandular erosion. After the vaginal examination several vesicles were discharged amidst more profuse hæmorrhage.

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Treatment; Next day the well-marked vesicular mole was removed by Dr. West, mainly from the vagina into which it had been expelled; only a few slight uterine attachments required to be loosened. A mild fever occurred in the first week.

After-history: On December 21, 1902, a healthy male child was born.

Case XV.—Disproportionate, four and a half months; undersized, four months' uterus.

Hydatid mole: Weight, 8 oz.; dimensions, 5 in. by $1\frac{1}{2}$ in. by 3 in; the right ovary measured 4 in. by 3 in.; the left ovary $3\frac{1}{2}$ in. by $3\frac{1}{4}$ in.

S. G., aged 29; six years married; no abortions; two children: each of the two labours was instrumental; a lacerated cervix was noted after the first labour. Her general health was good. She was admitted into the Hospital for Women, Liverpool, on May 21, 1902, at the request of Dr. Edward Gray, of Crewe, who had discovered the bilateral ovarian cystic disease and pregnancy.

The molar pregnancy—her third pregnancy—dated from the cessation of the last menstruation in the middle of January, 1902. Its clinical features: (a) Excessive vomiting; early in April—i.e., during the third month—there was a temporary cessation after medicinal treatment; a month later the vomiting returned and finally ceased by the middle of May after she had been in bed for fourteen days; (b) slight hæmorrhage, first observed early in May; hæmorrhage entirely absent during the last week of May. Its physical signs: The whole uterus—the fundus at the umbilical level—was raised forwards by the two cystic ovarian tumours lying beneath it within the pelvis and the lower abdomen.

Treatment: On May 30, 1902, during the ovariectomy by Dr. Briggs, assisted by Dr. Arthur Wallace, the following abnormal physical features were compared with those of the enlarged uterus of a normal pregnancy—(1) the serous coat was grooved from shrinkage of the uterine contents; (2) the uterus was undersized for the four and a half months' history of the pregnancy. Post-operative progress: On the third day the mole and blood-clot were expelled.

After-history: The patient was in perfect health on May 15, 1911.

Case XVI.—Disproportionate, three months; undersized, ten weeks. Hydatid mole.

E. B., aged 27; a healthy woman, the wife of a clerk; four years married; two healthy children, aged 3 and 1, born since an abortion between the second and third months of her first pregnancy.

The molar pregnancy. Its history: Since her confinement on January 3, 1892, the menses were totally absent except for a slight show for one day in November, 1892. She had weaned the infant in July. Pregnancy was dated from early in November, and early in December bleeding commenced and continued without intermission until her admission into the Hospital for Women. Its physical signs: An enlargement of the uterus equal to the tenth week of

pregnancy. The patient was anæsthetized on February 9, and the mole was removed by Dr. Briggs.

After-history: September 4, 1903. She has since had six children and recently an abortion; she is in excellent health.

INTRODUCTION TO GROUP C—UTERUS OVERSIZED—FOUR CASES.

In each of the two Cases I and II the total size of the uterus attained was in excess of the bulk of the hydatid mole: intra-uterine hæmorrhage contributed to the uterine enlargement; the exact extent of the contribution was beyond the range of calculation because a portion of the blood was inseparably incorporated with the mole, and the larger portion of free and collected blood belonged to the process of separation immediately preceding and actually attending the expulsion of the mole.

In each of the Cases III and IV the molar mass itself appears to the naked eye to have been sufficient to account for the size of the uterus, but each mole on microscopical examination was found to be mixed with blood.

In Case IV the clinical history is probably inexact in a single girl, aged 17.

In 1890 Dr. Aust Lawrence reported at the Obstetrical Society¹ an eight months' uterus with a two months' history, and ascribed the excessive enlargement to concealed accidental hæmorrhage and the diseased chorion.

In February, 1909, at the Obstetrical and Gynæcological Section,² Dr. Blacker apparently disposed of any uncertainty as to the occurrence of oversize of the uterus from the hydatid mole itself; the hydatid mole was exhaustively described by him, and figured in section within the oversized uterus; his complete examination excluded any appreciable amount of concealed hæmorrhage in the markedly oversized uterus 1 in. above the umbilical level with a nineteen weeks' history on July 18, 1908.

Findley's table of 210 cases in the March number of the *American Journal of Obstetrics*, 1903,³ includes Dr. Aust Lawrence's case of concealed hæmorrhage, and in the second of his own two cases Findley described the oversized uterus, removed by himself, as containing a firm blood coagulum in which the hydatid mole was enveloped.

¹ *Trans. Obst. Soc. Lond.* (1890), 1891, xxxii, p. 64.

² *Proceedings*, 1909, ii, pp. 202-22.

³ *Amer. Journ. Obst.*, New York, 1903, xlvii, p. 360.

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Case I.—Disproportionate, eighteen and a half weeks; oversized, five to seven months' uterus, rapid increase in two days.

Hydatid mole: Well-formed, large vesicles; weight of mole, 1 lb. 15 oz., and of blood-clot, 2 lb. 2 oz.

Mrs. F., aged 36; one stillborn child at the full term of her first pregnancy.

The molar pregnancy dated from the termination of the last menstruation a little before Easter (Easter day, April 20, 1908). Its physical signs: On August 28 the pregnancy had reached eighteen and a half weeks. Dr. G. F. R. Smith estimated that the uterus was a little undersized when he examined the patient in the out-patient room; she was admitted into hospital the next day, August 29. The uterus was reported to be a five months' uterus; during the next two days it became a seven months' uterus in size (August 31, 1908).

Treatment: On September 1, 1 lb. 15 oz. of mole and 2 lb. 2 oz. of blood-clot were removed from the uterus by Dr. R. A. Hendry, who found, when he commenced its manual removal, that the mole was partly decomposing and was partly protruding from the uterus.

Note.—There is no date of the onset of the slight continuous bleeding *per vaginam*, and no date of the onset of the oedema of the lower limbs; the albumin in the urine speedily vanished after the close of the molar pregnancy. The known undersize of the uterus was too momentary for classification as undersize.

Case II.—Disproportionate, four calendar months; oversized, five months' uterus.

Hydatid mole and decidua. Rapid increase in the size and the tension of uterus preceded the induced expulsion.

Mrs. L., aged 33; eleven years married; one abortion; three children.

The molar pregnancy dated from the cessation of the last menstruation on September 21, 1907. Its history: At the end of two months (in November) there was a faint blood loss; in December the blood loss was repeated, and in January, after a severe hæmorrhage for two days, a daily loss of blood continued until her admission into a private nursing home on January 26, 1908. She was then in good health. Morning sickness had not been excessive. Its physical signs: The uterus was appreciably larger than that of a normal pregnancy; the uterine walls were tense; the diagnosis of hydatid mole with intra-uterine hæmorrhage was made.

Treatment: On January 27, at 5 p.m., two shortened gum-elastic bougies were inserted *in utero*; uterine contractions were first noticed at 9 p.m. on January 28; at 1.5 a.m. on January 29 the hydatiform mole was expelled. At 11.45 a.m. Dr. Briggs saw the patient and, after chloroform had been administered, he removed, digitally, the retained remnants—in all 1 in. by 1½ in. of the molar mass.

After-progress: The local conditions were watched by Dr. Aylmer Lewis. Menstruation was excessive until April, 1908. After July 3, 1908, menstruation was again suppressed. On March 9, 1909, two healthy twin children were born a little beyond the eighth month of gestation; three weeks before this labour there was a solitary hæmorrhage, possibly from a placenta prævia, but the latter was not proved.

Case III (fig. 11).—Disproportionate, three and one-third months; oversized, four months.

Hydatid mole: Well formed with embedded blood-clot; weight, $10\frac{1}{2}$ oz.; abundant vesicles, recognizable portions of decidua and blood-clot.

Mrs. McC., aged 34; twelve years married; five children; one abortion twelve months previously.

The molar pregnancy dated from June 15, 1910, when the last menstruation ceased. Its history: During the next three months there was no bleeding;



FIG. 11.

Group C, Case III. Hydatid mole mixed with firm blood-clot; oversized.

vomiting was excessive; there was shivering, also a local chilliness in the abdomen. On September 20 a blood-stained watery discharge began and persisted until the expulsion of the mole on September 23. She thought her abdominal enlargement was noticeable.

After-history: October 26, 1911, in good health and normally pregnant at the sixth month.

Specimen presented by Dr. Willett and Dr. R. S. Taylor.

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Case IV (fig. 12).—Disproportionate, four weeks and six days; oversized, six weeks' uterus.

M. G., single, aged 17, a tobacconist. Menses: Regular, three days in every twenty-eight days.



Group C, Case IV. An early, very small hydatid mole.

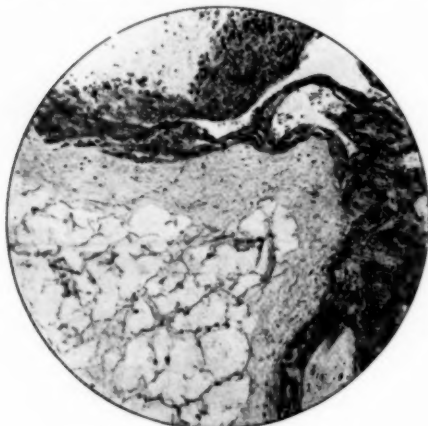


FIG. 12.

Group C, Case IV. Villi and blood.

The molar pregnancy in an anæmic girl who said she had not missed a menstrual period and that the bleeding began six days before her admission to hospital on September 17, 1908. Its history: The uterus was enlarged to the sixth week of gestation; the uterus was barely oversized. The mole in process of extrusion was digitally extracted on September 17, 1908. On microscopical examination a large proportion of firm blood is seen.

After-history: In good health, January, 1910.

INTRODUCTION TO GROUP D—HYDATID MOLE WITH CHORIO-EPITHELIOMA—TWO CASES.

In a series of twenty-three cases there were only two of hydatid mole with chorio-epithelioma; in each of the two cases concealed hæmorrhage was a marked feature.

Case I (fig. 13).—The hydatid mole is relatively smaller than the corresponding period of the pregnancy.

Mrs. B., aged 43, gave a normal menstrual and obstetrical history; free from abortions; she had borne ten children. During many recent months her husband's intense business worry had disturbed her general health; her nights had become almost sleepless; she had lost flesh; when pregnancy occurred she loathed its continuance. The commencement of the pregnancy was either May 9 or June 30, 1900; the latter was the last day of a delayed and curtailed blood loss. On and after September 7 the pregnancy was complicated by continuous hæmorrhage, which further reduced the feeble general health of the patient, until an almost deathlike pallor of the lips was observed on October 12. On this day Dr. Briggs was asked to see her with Dr. Francis Johnston, of Birkenhead; the uterus was judged to be harder than the normally pregnant uterus; smaller than the average size of a pregnancy dating from May 9 and larger than that of a pregnancy dating from June 30; ballottement was absent. The provisional diagnosis of hydatidiform mole was made, and three gum-elastic bougies were placed *in utero*, as it was feared that the loss of blood from immediate digital extraction might be fatal. The mole was expelled on the evening of the next day. Then followed a month's slight and continuous blood loss, occasional rises in temperature, and no improvement in general health.

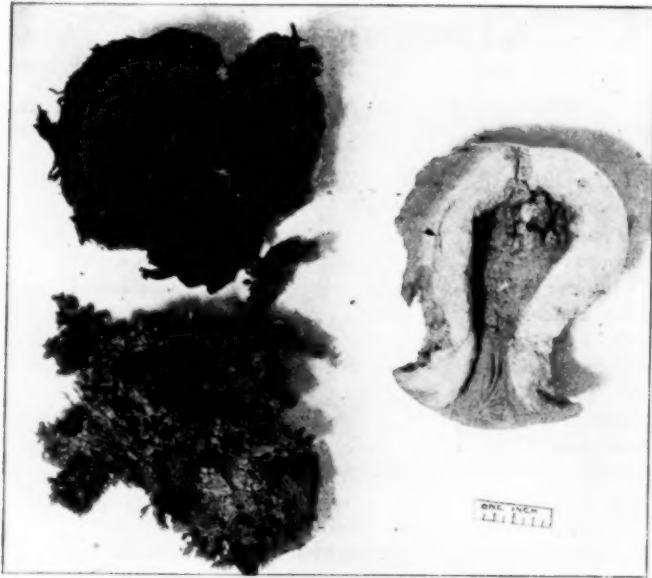
On November 12 Dr. Briggs again visited the patient and digitally explored the interior of the uterus, wherein was found an excavating ulcer with indurated raised edges. Between November 12 and November 28 the fever became higher; as no improvement in the general health was possible without operation, on November 28 the uterus was extirpated *per vaginam*. The patient only survived the operation eight days. A necropsy was not allowed.

The morbid condition of the uterus was thoroughly investigated by the Gynæcological Fellow in Pathology, Mrs. Budden. The disease was chorio-epithelioma.

Case II (fig. 14).—Collected blood. Hydatid mole.

A. E., aged 31; seven years married; three children, the youngest aged 2; three abortions, the last three years ago. Menstruation regular, four to five days every twenty-eight days; good general health previously.

The molar pregnancy dated from the last day of the last normal menstruation on November 16, 1906. Its history: After two months a blood loss, except for three days, continued from January 16 to February 16, 1907; on the



Group D, Case I. Blood and mole; the uterus and chorio-epithelioma.

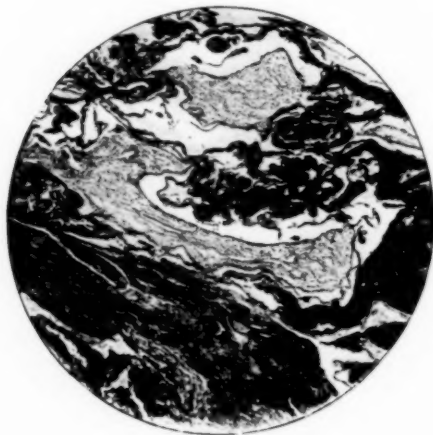


FIG. 13.

Group D, Case I. Villi and a large admixture of blood.

latter day she was admitted to hospital. Its physical signs on admission: Right obliquity of the uterus; a smooth, tense uterine enlargement; the fundus uteri 1 in. above the umbilicus, as at the end of the sixth month. The patient was seriously ill, blanched and sallow; her pulse 120, and her temperature 100° F. The blood loss persisted and the pulse-rate increased.

Treatment: Uterine expulsive pains were excited by the introduction of three gum-elastic bougies on February 16, 1907. Next day the molar mass was expelled, together with a large quantity of old blood. This was at the end of the third month of molar gestation. The molar mass is represented life-size in the right-hand jar. The larger collection in the left-hand jar consists of blood and illustrates the extent of the intra-uterine bleeding which preceded and attended the expulsion of the mole, and accounted for the high tension and the abnormally large size of the uterus at the end of the third month.



FIG. 14.

Group D, Case II. Villi and blood.

After-progress: Convalescence was delayed by fever, general weakness and local fætor. For the local fætor an intra-uterine douche was occasionally given. On March 16 the patient's temperature was normal and she left the hospital for the Convalescent Home. In April the menstrual period lasted sixteen days. In May, three to four days without clots. In June, large clots came away and daily bleeding recurred until she was readmitted to the hospital on June 18, 1907, with a fluctuant, fixed swelling, 2 in. in diameter in the right iliac fossa, and a large, hard, mobile uterus. She looked ill. An exploration of the uterine cavity revealed a chorio-carcinoma. Operation: Abdominal section, June 21, 1907; removal of the uterus and both appendages as shown, life-size, in the drawing. In the right ovary was an abscess with $1\frac{1}{2}$ oz. of fætid pus.

After-history: The patient is in excellent health (January, 1912).

SUMMARY.

It is not impossible—it is unlikely—that a series of twenty-three cases in which the features and associations of hydatid mole are otherwise so extensively embodied and confirmed, will prove to have been exceptional in the prevalence of the one physical feature of undersize of the uterus.

Undersize of the uterus in sixteen cases, with frequent quiescence and occasional recedence of the mole, in the series of twenty-three widens the differential diagnosis in cases of missed abortion and intra-uterine death of the foetus, and modifies the current and contrary statements.

In oversize of the uterus the part played by concealed intra-uterine hæmorrhage is apparently higher in frequency and greater in effect than has been generally stated.

The tendency of cases of hydatid mole towards malignancy comes out in the series with a diminished ratio: this fact may be cited although excluded from the scope and intention of the paper.

APPENDIX—HYDATID MOLE.

Incomplete and valueless records exclude three cases from the whole of the author's experience in cases of hydatid mole.

Case I.—A. D., aged 26; thin, pale and delicate looking; — years married.

Previous history: In November, 1892, the right kidney had been removed by Sir William MacCormac for hydronephrosis and calculus.

The history of the molar pregnancy dated from May 3, and bleeding commenced on August 3. Incomplete spontaneous expulsion of the mole: the remainder was digitally removed on September 2, 1895. The diagram on the hospital case-sheet indicates the size of the uterus, when the patient was first examined, a little larger than the normally pregnant four months' uterus.

September 4, 1903: Attempts to trace the patient entirely failed.

Case II.—E. H., aged 24, of rather delicate health, the mother of one child, aged 13 months, born one year after marriage.

The history of the molar pregnancy covered a period of three and a half months—six weeks' menstrual suppression and eight weeks' hæmorrhage. The mole was expelled on November 19, 1894, in my absence; the specimen was not preserved.

September 4, 1903: She has since had four children and is in good health.

Case III.—About three years ago a case of hydatid mole was examined in out-patients'. A note of the undersized uterus was made. The mole was expelled. She was obstetrically treated at home; the mole was not preserved.

Hearty and grateful thanks are tendered to Dr. Willett, the Sub-Curator of the Museum of Obstetrics and Gynæcology; to the Gynæcological Fellows in Pathology, Mrs. Budden and Dr. Emrys Roberts; and particularly to Dr. T. E. Jones, who has compiled most of the cases, and to Mr. Norman, whose sections and photographs have been skilfully and excellently produced.

DISCUSSION.

Dr. GRIFFITH drew attention to the unreliability of the measurements of the size of the uterus when taken in relation to the navel, for while the usual height of the lower border of navel above the pubes is just 6 in., in a considerable number of women it measures from 5 in. to 7 in. Added to this is the difficulty of certain knowledge of the duration of pregnancy. At the same time he was quite prepared to agree with Dr. Briggs that a uterus containing a cystic mole was often smaller than a normal pregnant uterus of the same period. Dr. Griffith was not surprised that Dr. Briggs avoided the question of diagnosis. His own experience was that when the cervix was closed his diagnosis had usually been at fault.

Dr. BLACKER wished to express his appreciation of Dr. Briggs's paper, and of the interesting series of specimens illustrating it. For some time past he had, as no doubt many Fellows of the Section had, been in the habit of teaching that in cases of hydatidiform mole, the size of the uterus might be greater than, less than, or equal to the size of the organ at the corresponding period of pregnancy. Up to the present time, however, he had always thought that in the majority of the cases it was larger, but the facts brought forward by Dr. Briggs conclusively showed that in a considerable number of such cases the uterus might be definitely smaller than it ought to be. At the same time he gathered that in many of cases quoted in support of this fact the moles had been retained some time *in utero*; and might not this afford an explanation of the apparent anomaly? It seemed quite possible that if these cases had come under observation in the early months of the pregnancy the uterus would in reality have been larger than the normal, but that during the period of retention the mole had undergone retrogressive changes and shrinkage, with the result that the uterus was smaller when examined than corresponded to the period of pregnancy reached. A hydatidiform mole might well have a certain period of life, after which it ceased to grow, and underwent atrophic changes and even a diminution in size. If this were so, then in a considerable

number of the cases in which the mole had been retained beyond the usual time in the uterus, the size of the latter might well be less than that of a healthy uterus at the same period of pregnancy. He did not quite understand how the size of the uterus had been arrived at in the cases in which the mole had been expelled before it came under observation. An estimate of the size of the uterus from that of the mole seemed to him open to several fallacies dependent upon the tendency to shrinkage after being kept for any length of time, and the escape, which could hardly be prevented, of a good deal of the contents of the vesicles. He gathered from some of the specimens in which the uterus was larger than the normal, that the author of the paper thought some of the increase at any rate was due to the presence of considerable quantities of blood *in utero*, but the case of a hydatidiform mole *in utero* he had had the honour of showing to the Section, mentioned by Dr. Briggs, proved conclusively that the undue enlargement of the uterus, at any rate in that case, was not due to blood, but to the size of the mole itself. In his specimen there was practically no blood in the uterus, although the patient probably died from the effects of external hæmorrhage. The matter was one of great clinical interest and he thought that Dr. Briggs had certainly proved his point.

The PRESIDENT (Dr. Amand Routh) had seen several cases of hydatid mole where the uterus was not enlarged beyond the supposed period of gestation. He was surprised that one of the cases of chorionepithelioma had been preceded by one of the smaller varieties of hydatid mole. He had thought it probable that the larger hydatid moles, showing more activity of growth and greater vascularity, were more likely to develop chorionepithelioma than the smaller and more quiescent ones. He congratulated Dr. Briggs on his valuable contribution to the knowledge of the subject.

Dr. BRIGGS, in reply, shared with the speakers the too frequent uncertainties, if not the practical impossibilities, of substantiating statements as to size changes within the abdomen: these drawbacks, however, cut both ways, affecting both oversize and undersize, principally in changes of slower and lesser degrees, but the predominance in the long run would come out. As to whether oversize or undersize was the prevalent feature the text-book teaching had left the student in no doubt; latterly there had been a glimpse of a growing inclination to admit undersize. Dr. Briggs explained he had himself tardily yielded to an eighteen years' acquaintance with undersize because he had seen it repeatedly verified and the intra-uterine hæmorrhage recently observed in Case I encouraged further inquiry.

Dr. ROBERT WISE showed a metal tube designed for keeping open the cervical canal after dilatation.

Obstetrical and Gynaecological Section.

February 1, 1912.

Dr. AMAND ROUTH, President of the Section, in the Chair.

A Degenerating Uterine Fibroma.

By J. INGLIS PARSONS, M.D.

THIS specimen was removed from Mrs. C. (a patient of Dr. A. E. Stoker), aged 45; no children. She had been suffering from severe attacks of pain in the abdomen lasting for some weeks and coming on every few months. She also complained of great weakness, which has been getting worse for the last three years. Menstruation was irregular. Two to three months had been missed several times, and then a profuse loss occurred, lasting for fourteen days. The bladder usually acted normally, but during the attacks of pain she suffered from frequency of micturition, and on two occasions from retention. Constipation is a prominent symptom, which causes a great deal of trouble.

On examination the pelvis was found to be filled by a large mass, impacted, and consisting of a retroverted uterus enlarged by multiple fibromata. The swelling extended above the pubes half-way to the umbilicus. On the left could be felt a round elastic swelling the size of a small orange, and on the right side a larger, somewhat round, hard tumour.

At the operation on November 29, 1911, evidence of old peritonitis was found, in the shape of numerous adhesions of the small intestine to the pedunculated myoma undergoing degeneration. The elastic swelling on the left side was produced by a cystic ovary. The large mass was found to be a retroverted uterus with several fibromata impacted in the pelvis. After separating the adhesions and removing the enlarged

ovary and pedunculated fibroid, the main mass was removed by supra-vaginal hysterectomy.

The patient made a very good recovery considering her weak condition.

REPORT BY BRYDEN GLENDINING, M.S.

The specimen consists of an ovoid mass, irregularly nodular, firm, and showing a surface generally covered by a white roughened membranous capsule, which is readily stripped off; adherent to this capsule are a few tags of fatty tissue which are readily detached from it.

The tumour on section shows the characteristics of a fibromyoma, but differs in that in colour it is mottled by an irregular dark maroon staining of various areas and strands, and is of softer consistency. In one or two places near the middle the tumour appears to contain earthy material.

Representative pieces under the microscope show changes indicative of widespread degeneration of the mass; these are, almost complete absence of staining properties, loss of structural characteristics, and areas of deposition of earthy salts. The capsule and the portion immediately subjacent to it alone show staining reaction. The appearances suggest a late stage of either hyaline or red degeneration.

**Specimen of a Fibromyomatous Uterus removed for Pain
Twenty Years after Apostoli's Treatment.**

By J. INGLIS PARSONS, M.D.

E. J., AGED 35, two children, first came to the Chelsea Hospital for Women on October 29, 1891. She had then been suffering for four years from severe menorrhagia with much pain in the abdomen and thighs. Menstruation lasted a week and she used forty-eight diapers. Between the menstrual periods there was considerable watery discharge. Examination revealed a large irregular mass forming part of the uterus, and reaching half-way to the umbilicus. On the left side a projecting tumour could be felt through the abdominal wall about the size of an orange. Fourteen applications of the constant current were then given, with an average strength of 100 ma., for fifteen minutes. At the end of three months all her pains had gone, and the loss was reduced

from forty-eight diapers to eighteen. The tumours remained the same size.

A year later, in April, 1893, she came again; the menorrhagia had recurred, and the tumours were larger and reached to the umbilicus. Ten applications of the constant current were then given, and the menorrhagia again reduced to normal, but she still had a good deal of watery discharge during the intermenstrual period.

She came to see me once a year after this. In 1894 the tumours were rather smaller, and only reached an inch below the umbilicus. She remained *in statu quo* for another five years until 1899, when she began to lose more, but not profusely. In 1901 menstruation decreased and came on every nine weeks. The tumours also decreased in size, and only just reached above the pubes. 1902: She missed three periods and then had a profuse loss. 1903: Menstruation was very slight, and nothing was seen for six months, but the swelling increased in size and again reached the umbilicus. 1904: Menstruation practically ceased. She only had a slight show on two occasions. Tumour decreased one-fourth in size. During the next six years she had no further trouble, until 1911, when the uterus had shrunk so much in size that it had sunk into the pelvis and was able to retrovert. The pressure of the fundus on the posterior wall of the pelvis caused her a great deal of pain, and she came for relief on June 5, 1911. The perineum was repaired so as to enable a pessary to keep the uterus in position. Although a good perineum was formed by the operation the pessary failed to act, probably because of the extra weight of the uterus. As she still suffered a great deal of pain subtotal hysterectomy was performed in November, 1911. She made a good recovery, and since then has been quite free from pain.

REPORT BY BRYDEN GLENDINING, M.S.

The specimen consists of a uterus with both the lower part of the cervix and the appendages missing. The peritoneal covering is normal, and the uterus, globular in form, is enlarged to about double the normal size.

On section the posterior wall is seen to be occupied by an almost spherical tumour which stretches and elongates the uterine cavity; it shows typical whorled arrangements in the peripheral parts, but centrally is seen a dark red irregularly outlined patch, which is softer than the rest of the growth. In the anterior wall there is a small myoma of

the size of a hazel-nut. The endometrium is red, but does not appear thickened.

Sections through the uterine wall show microscopically an endometrium with dilated vessels, some effusion of blood, and few glands. The muscle is scanty and appears in places hyaline. This is especially seen surrounding the vessels where the sclerosed walls blend with the surrounding hyaline tissues.

The section through the small fibroid in the uterine wall again shows areas of marked hyalinization. The myoma is hyaline and almost completely denudeated.

Sections through the larger myoma show numerous thick-walled vessels in which the thickening of the muscular coats is often irregular, and has undergone a hyaline degeneration, with the result that in many of these thickened walls there is not a single nucleus to be seen. The tissue of the myoma shows areas of both myxomatous and hyaline degeneration.

DISCUSSION.

MR. ALBAN DORAN remarked that electricity and amputation of the ovaries both caused uterine "fibroids" to diminish in size in certain cases, but experience taught us that both these discredited methods proved most uncertain. Twenty years ago Dr. Percy Boulton employed electrolysis at the Samaritan Free Hospital, and in some instances the fibroids almost disappeared, whilst in others neither the bleeding nor the growth of the tumour was checked. At the same time amputation of the ovaries for the "cure" of fibroids was extensively practised by himself (Mr. Doran) and his colleagues at the same hospital. According to rule, all ovarian tissue had to be removed, whilst no benefit was to be expected if the fibroid lay in the lower segment of the uterus or involved the cervix. But removal of all ovarian tissue was in many instances impossible, and where it was practicable "cure" did not always ensue, although the fibroid lay entirely in the upper part of the uterus. On the other hand, in two cases, at least, where Mr. Doran failed to remove all ovarian tissue, whilst the tumour involved the lower uterine segment, diminution steadily followed the operation, and the uterus ultimately almost regained its normal dimensions. These experiences taught us that something could cure a fibroid and that we did occasionally cure fibroids both by electricity and by oöphorectomy in those days. How we cured them, however, remains a mystery. Our theories were incorrect and our treatment, little as we thought so at the time, was absolutely empirical.

MR. BUTLER-SMYTHE wished to know if Dr. Inglis Parsons had tried the effect of dieting in this special case? For many years he (Mr. Butler-Smythe) had treated patients with fibroid tumours of the uterus by putting them on a diet which excluded starch and sugar, together with all sweet wines and malt

liquors. As for the results, all he could say was that he rarely found it necessary to perform hysterectomy, and in many instances the tumours ceased to grow, and the patients were able to enjoy life. Drugs, such as ergot and bromides, may have contributed to such a result, but in his opinion diet was the main factor.

Dr. INGLIS PARSONS, in reply to Mr. Alban Doran, said that the treatment of fibroids by electricity was not entirely empirical. A paper of his appeared in the *Transactions of the British Gynæcological Society* for 1889, in which he demonstrated the coagulating action of the positive pole on the web of the frog's foot. Under the microscope, using a fine platinum needle and a small current, the sealing-up of the blood-vessels could be actually seen to take place, while the negative pole did not produce the same effect. As the result of other experiments he had found that there was no molecular decomposition in the interpolar region, although it was possible to cause a molecular exchange. In 1890 he had predicted that it would not be possible to make fibroid tumours disappear with the use of electricity, although it would be possible in some cases to interfere with their nutrition and prevent them from growing. He had not had any experience of the effects of diet on the tumours. In regard to medicines, thyroid extract appeared to have some effect.

The Presence of Blood-pigment in the Fæces of the New-born.

By HECTOR A. COLWELL, M.B., and BRYDEN GLENDINING, M.S.

As hæmorrhage from the bowel is occasionally found as a pathological condition in the new-born, it appeared to us interesting to determine whether blood or blood-pigments were normally present in the fæces of infants during the first ten days of extra-uterine life. As a test we employed the benzidine reaction. This, when carried out as presently described, has been shown to be both delicate and reliable when the subject is placed upon a diet free from animal food or green vegetables—a condition which is obviously fulfilled during the first ten days of life. The test depends upon the fact that benzidine when in solution with hydrogen peroxide or sodium perborate undergoes oxidation to a bright purple or green substance in the presence of blood-pigments.

The material for the benzidine test was treated with glacial acetic acid and extracted with ether. The ethereal extract was pipetted off and about 5 c.c. taken for testing.¹ In all, the fæces of fifty infants were

¹ The benzidine solution is made by dissolving 0.1 grm. of benzidine and 0.1 grm. of sodium perborate in 10 c.c. of glacial acetic acid.

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examined. In the majority of cases the material was only obtained every third day. The result is shown in the following tables:—

TABLE I.—GENERAL TABLE OF RESULT OF TESTS.

Day	Positive	Negative
First	14	0
Second	19	2
Third	15	1
Fourth	15	3
Fifth	3	3
Sixth	4	3
Seventh	1	8
Eighth	3	3
Ninth	1	6
Tenth	1	4
Eleventh	—	—
Twelfth	1	0

Positive = presence of blood-pigment. Negative = absence of blood-pigment.

TABLE II.—EXAMPLES FROM THREE CASES.

Day	Case 9 (male)	Case 17 (female)	Case 39 (male, Cæsarean)
First	+	—	+
Second	+	+	+
Third	+	0	+
Fourth	+	+	+
Fifth	—	0	—
Sixth	0	+	+
Seventh	—	—	—
Eighth	—	—	—
Ninth	0	—	—
Tenth	0	—	—
Eleventh	—	—	—
Twelfth	—	—	+

+ = positive, presence of blood-pigment. 0 = negative, no blood-pigment.
— = fæces not tested on that day.

Now, given the presence of blood-pigment, it at once occurred to us that its origin might possibly be the mother's milk, but this was negated by the fact that milk obtained at varying periods after delivery failed to give the benzidine reaction. The next possibility was that during the compression of delivery, blood, effused from the nose or nasopharynx and swallowed, gave rise to the presence of blood-pigment. Consequently, in many cases, the throats of new-born infants were gently swabbed with cotton-wool, and in all cases the ethereal extract gave a negative reaction.

Compression of the abdomen, causing slight hæmorrhage from the intestine, appeared to us another possible explanation, but this was negated by the fact that in two cases of Cæsarean section a distinct positive reaction was obtained.

The possibility that the reaction was due to bile salts and pigments was shown by A. J. Clark¹ to be untenable.

Lastly, we fall back upon the physiological explanation, that the sudden circulatory disturbance resultant upon the change to extra-uterine existence leads to minute hæmorrhages into the intestinal canal, and that once equilibrium of the circulation has become established the hæmorrhage ceases. This occurs normally at the third or fourth day.

The material for this investigation was taken from the maternity wards at the Middlesex Hospital, and we are indebted to Dr. Comyns Berkeley for the permission to obtain it.

DISCUSSION.

Dr. HERBERT SPENCER called attention to a few observations he had made of congestion and hæmorrhage in the stomach and intestines in his paper on "Visceral Hæmorrhages in Stillborn Children."² One of the children died of intestinal obstruction produced by hæmorrhage into the cæcum.

Dr. GRIFFITH said that if, as he understood from Dr. Glendining, blood-pigment was found in the meconium at birth, and if it was found in the meconium of fœtuses dead *in utero*, it would probably be considered a physiological constituent.

A Rachitic Assimilation Pelvis.

By W. S. A. GRIFFITH, M.D.

THIS specimen is one of the pelves which belonged to the Obstetrical Society, and was presented by the Royal Society of Medicine to the Museum of the Royal College of Surgeons. The case was recorded in the *Lancet*³ by the late Dr. Yarrow, in connexion with the operation of Cæsarean section which was performed for the delivery of the patient. The peculiar characters of the sacrum were not recognized at the time. The obstetrical interest in this specimen is practically confined to its rachitic characters, and the description of the operation by Dr. Yarrow, and subsequent treatment of the patient until death, present a strange

¹ *St. Bartholomew's Hosp. Reports* (1909), 1910, xlv, p. 97.

² *Obstet. Trans.* (1891), 1892, xxxiii, pp. 203-300.

³ *Lancet*, 1872, ii, p. 523.

picture to those who are not conversant with the surgery of those pre-Listerian times, and need not be discussed on the present occasion.

The patient's age was 34. She miscarried in the third month of her first pregnancy, and Cæsarean section was performed for her delivery at the end of her second pregnancy. Her height was 4 ft. 2 in. General rachitic deformities were well marked. The pelvis is characteristic of rickets, the individual bones being small, and greatly deformed in the usual manner, there being marked antero-posterior flattening, the ilia are everted, the pubic arch widened, and the sacral curve much diminished. The left side of the first sacral vertebra has the structure of a lumbar vertebra, the right side is normal and takes part in the sacro-iliac joint. The smaller size of the left half of the vertebra which takes no part in the left sacro-iliac joint brings the left synchondrosis $\frac{1}{2}$ in. nearer the middle line than the right, and the lesser depth of the left side of the body of this vertebra ($\frac{3}{4}$ in.), compared with the right side (1 in.), was probably one cause of the lateral lumbar curvature convex to the left, which existed during life. The measurements of the pelvis are: Interspinous, 9 in.; intercrystal, 9 in.; conjugate external 5 in. Pelvic brim: Conjugate diagonal, $2\frac{3}{4}$ in.; conjugate true, $2\frac{1}{2}$ in.; oblique (both), 4 in.; transverse, $4\frac{1}{2}$ in.

There is an extensive literature relating to this variation in development of various vertebræ, to some of the more important of which reference will be made. It can be arranged under three headings: (1) Embryology and Anatomy; (2) Orthopædics; (3) Obstetrics.

It is well known that vertebræ may be wholly, or in part, missing from the spinal column, also that additional parts of vertebræ may be interposed in the spinal column. Röntgen photographs enable this to be ascertained during life. It is also known that in the development of the pelvis and thorax, either of them, especially the innominate bones and more rarely the ribs, may be shifted upwards or downwards by one vertebra, so that in the case of the pelvis the fifth lumbar may unite with the first two sacral to form a sacro-iliac joint, or if the displacement is downwards the first sacral has lumbar characters and the sacro-iliac joint is formed principally by the second and third sacral segments. This variation by which a vertebra assumes the form of the vertebra above or below it is known as "assimilation." The vertebræ liable to these variations are described by anatomists as "transitional vertebræ"—*Uebergangswirbel*. These occur at the occipito-cervical, the cervico-dorsal, dorso-lumbo, lumbo-sacral, sacro-coccygeal articulations. The variation is usually unilateral but may be symmetrical.

Dr. Max Böhm examined forty-one spines, showing these variations collected by Professor Dwight, Director of the Anatomical Department of the Harvard University, Boston, and found twenty-three variations in an upward (cranial) direction, eighteen in a downward (caudal) direction. Eight of the first group (cranial deviation) were male, fifteen, female. Of the second group (caudal deviation), sixteen were male and two female. Of the forty-one, seven only showed symmetrical variations, thirty-four unilateral. This, as he points out, appears to show that the female spine has a strong tendency to vary in a cranial direction, the male in the caudal direction. He also found that the variation in the cranial direction was common on the left side of the spine, whereas the right side has a similar tendency to vary in the caudal direction. Dr. Böhm's interesting paper was published in the *Boston Medical and Surgical Journal*, November 22, 1906. He is surgeon in charge of the very extensive mechanical department for the treatment of orthopædic cases in the Massachusetts General Hospital, Boston.

Emil Rosenberg,¹ Professor of Anatomy at Utrecht, who has studied this question embryologically, suggests that the displacement downwards is atavistic, a return to a lower state of development; while a displacement upwards is also a step upwards in evolution.

Professor Bardeen,² in a paper on "The Numerical Vertebral Variations in the Human Adult and Embryo," states that 15 or 16 per cent. of all human beings show some degree of numerical variation.

One of the most important papers referred to by most recent writers on this subject is that by Professors Breus and Kolisko³ in which they discuss the whole question minutely as it relates to the pelvis. They point out that the three upper sacral vertebrae are developed from five centres of ossification: one for the body, one on each side on the anterior surface from which the greater part of the sacral wing develops, and one for the neural arch and transverse process. They do not mention the two lateral epiphyseal plates which, according to Keith,⁴ are independent formations. If, in the development of the pelvis, the iliac bones do not descend far enough or too far, these assimilation changes take place. Keith, quoting Rosenberg and Paterson,⁵ of Dublin, says

¹ *Morpholog. Jahrb.*, Leipz., 1899, xxvii, p. 1.

² *Anat. Anzeiger*, Jena, 1904, xxv, p. 497.

³ "Die Pathologischen Beckenformen," Leipz. u. Wien, 1900, i, Theil I, p. 169.

⁴ Keith, "Human Embryology and Morphology," 1904, 2nd ed., p. 179.

⁵ *Trans. Roy. Dubl. Soc.*, 1893, v, ser. 2, p. 123.

that in 95 per cent. of cases the twenty-fifth vertebra forms the first sacral, in 1 per cent. the twenty-fourth (fifth lumbar), and in 3 per cent. the twenty-sixth. In the embryo it is the twenty-sixth (second sacral) that forms the first of the sacral series, and later the twenty-fifth throws out great lateral masses and forms a connexion with the ilia. In the lower primates (monkeys) the twenty-seventh forms the first sacral. With the evolution of man the twenty-sixth, later the twenty-fifth, underwent sacral modification, the trunk being correspondingly shortened. They also point out that if the sacrum is composed of six vertebræ its cavity is lengthened; if of four only it is shallow and shorter. They describe five chief varieties, with intermediate ones, all interesting from a descriptive point of view, but not of much practical obstetrical importance.

- (1) High assimilation pelvis.
- (2) Transversely contracted assimilation pelvis.
- (3) Mitten Platte assimilation pelvis.
- (4) Low assimilation pelvis.
- (5) Asymmetrical assimilation pelvis.

(1) High assimilation, in which the fifth lumbar is united to the first sacral. There is no transverse contraction.

(2) A similar condition, with transverse contraction at the brim, but in the specimens he figures the transverse contraction is only relative to the conjugate, each measuring 5 in., with the exception of fig. 44, which was taken from a young woman, aged 20, where the conjugate is $4\frac{1}{4}$ in. and the transverse diameter $4\frac{1}{2}$ in.

(3) They call "Mitten Platte," to which name it is difficult to give an English equivalent. In this form the first and second sacral segments are bent back so that the promontory is formed by the junction of the second and third segments; thus the space between this promontory and the pubes (the available conjugate) is less than the true conjugate, but in all three specimens (figs. 53, 56, and 58) there is ample space.

(4) Low assimilation. In this the first sacral segment is free, having lumbar characters, the sacrum is therefore wanting in breadth, the ilio-sacral joint being almost entirely formed by the second sacral segment, the promontory is low, but the transverse diameter is in each case lengthened.

(5) Asymmetrical. In this group only one half of the vertebra has assimilation characters. Each half is, as a rule, nearly perfect in its

details. It is the first sacral that is usually affected in this way. There is usually ample space in these cases.

They figure and give measurements of examples of each of these varieties, but in no instance recorded by them or by others that I have examined of adult pelves and pelves free from other deformities is there evidence of contraction which would be of obstetrical importance. The relative internal pelvic measurements are often altered, but there is ample space for the passage of an average child. Their paper is probably, however, the most important, and certainly the most minute, in its description of this form of pelvis.

The paper by Professor Bayer¹ is also an important one and should be studied.

Of very different importance, however, are these spinal variations in relation to spinal curvature. The evidence is conclusive that "habitual" scoliosis—that is, lateral curvature of boys and girls, congenital but not developing until school age, and commonly attributed to the habit of sitting or standing badly—is attributable to the asymmetrical development of spinal vertebræ.

Mr. A. H. Tubby, in his book on "Orthopædic Surgery," p. 414, and in other places refers to this subject, and I am indebted to him for being allowed to study the proofs of the new edition of his work and for important references contained in it.

The work of Dr. Böhm has been already referred to; Perrone,² of Naples, describes three specimens in the Pathological Institute at Berlin.

The earliest reference to the subject that I have found is by Durr.³

Another specimen of "low assimilation" from the College of Surgeons, and two specimens of "high assimilation" from St. Bartholomew's Hospital, were also exhibited.

DISCUSSION.

Mr. ALBAN DORAN observed that the question of assimilation was morphological and anthropological, whilst von Winkel and others maintained that it had little to do, directly at least, with pelvic contraction—in other words, with obstetrics. He turned the attention of the Section to Professor Arthur Keith's

¹ "Das Becken und seine Anomalien," 1908, i, Heft 2, p. 196.

² *Zeitschr. f. Orthop. Chir.*, Stuttg., 1906, xv, p. 353.

³ "Ueber die Assimilation des letzten Bauchwirbels an das Kreuzbein," *Zeitschr. f. rationelle Med.*, Leipz. u. Heidelb., 1860, 3 Reihe, viii, pp. 185-200.

article in the thirty-seventh volume of the *Journal of Anatomy and Physiology* (1903), entitled, "The Extent to which the Posterior Segments of the Body have been Transmuted and Suppressed in the Evolution of Man and Allied Primates." In the lower monkeys there are about twenty-six vertebræ above the sacrum, the twenty-sixth being the last lumbar. Higher up, the twenty-fifth becomes gradually sacral: this is seen in the gorilla and chimpanzee, as in man.¹ Strange to say, in the orang-utan the twenty-fourth becomes sacral, although that animal does not appear otherwise more angelic than man, whilst in man the twenty-fifth vertebra, our first sacral, may, as in the "Yarrow pelvis," which Dr. Griffith was showing us this evening, become in some respects lumbar. It was not certain, however, that this implied reversion to a lower type, nor must we take for granted that this abnormality never involved pelvic contraction. Whitridge Williams, unlike von Winckel, believed that there was a certain amount of contraction, and Mr. Doran noted that in unilateral "assimilation" the first sacral vertebra was distinctly narrower on the side where its transverse process, of the lumbar type, replaced the normal lateral mass. Diagnosis of these "assimilations," however, could not be made on the live subject.

Dr. BLACKER thought that the main interest of the specimen lay in the association of a well-marked rickety pelvis with the changes due to assimilation. As Mr. Doran had said, these pelves probably had not attracted much attention from the obstetrician because they possessed little obstetric interest. The association of the two changes in the one pelvis was, however, interesting, and several writers, especially Tridondani, had pointed out that there was no connexion between rickets and an assimilation pelvis. The Italian writer had published eight examples of this variety of pelvis, and had clearly shown that all the cases published by Breus and Kolisko bore out his view that the two conditions present in this specimen when they occurred together did so merely as a coincidence. This indeed was what might be expected, since the changes in an assimilation pelvis must take place at a very early stage of development, while the rickety changes, of course, took place generally after birth. It was true that a few cases of beading of the ribs, with delayed ossification of the bones of the skull, and bending and greenstick fracture of the long bones, had been recorded in new-born fetuses, but the occurrence of true foetal rickets was very rare indeed. So far as he knew no case had been recorded in which the rickety changes were so marked as to affect the form of the pelvis.

¹ In these apes, however, there are thirteen rib-bearing to four lumbar vertebræ.

² *Annali di Ostetricia e Ginecologia*, Milano, 1902, xxiv, pp. 1-44.

**Supravaginal Hysterectomy performed during Pregnancy
instead of Induction of Abortion, with Sterilization, for
repeated Puerperal Melancholia.**

By W. S. A. GRIFFITH, M.D.

THE question of the premature termination of pregnancy in mental cases is one that presents many difficulties which cannot be determined in any case by hard and fast rules.

In the first place it is necessary to exclude those cases whose disease is an aversion to pregnancy, and whose attempts to simulate mental disease may be clever enough to gain their purpose. We must also exclude cases in which no benefit to their mental state is likely to follow the operation. If we succeed in excluding these two groups we are left to deal with the third group, in which we may reasonably expect that our interference will be followed by unmistakable benefit to the patient.

The case I bring before you belongs to the third group, and the point I raise for discussion is the special reason that necessitated the termination of pregnancy in the manner in which it was done. The termination of pregnancy for any of the well-recognized causes may, on a single occasion, be performed after due consideration without question as to the propriety of so doing, but if the woman is young, and the disease chronic, as in chronic nephritis, and these are mental cases, we may well hesitate to induce abortion on each recurrence of pregnancy, which may indeed mean two or three times in a year. There is therefore a group of cases in which sterilization is urgently needed as an additional method of treatment. In mental cases of all others it is essential that the operation should be as painless, simple, safe, and of short duration as possible, so as to diminish the mental strain on the patient.

Induction of abortion, without an anæsthetic, means usually a period of somewhere about twenty-four hours, and then an anæsthetic may be needed to complete the emptying of the uterus, and the administration of an anæsthetic means to the patient an operation. A short time after, the operation for sterilization would have to be performed. It seemed therefore desirable, when the case to be referred to came under consideration, to combine the two in one operation by a supravaginal

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hysterectomy, leaving the ovaries, and endeavouring to leave some of the mucous membrane of the body of the uterus also. The result to the patient seemed to justify this procedure under the particular circumstances of the case.

I first saw the patient in June, 1907, with Dr. Mackintosh, of Hampstead. Her age was then 24. She was confined in the May previously, the labour being terminated with forceps to the large head. No mental or other complication arose until ten days after delivery. She then became listless and melancholic, with suggestions of suicide. Under Dr. Mackintosh's care she gradually recovered, and had no further trouble until her next confinement in February, 1910. Her convalescence was normal until the fourth week, when her depression returned greater, and she needed careful nursing for five months. Unfortunately at the end of the year she again became pregnant, and I saw her with Dr. Mackintosh in January, 1911. Pregnancy, it was believed, commenced about October 24, 1910. I found her to be in the third month of pregnancy, and very anxious indeed as to her possibility of going through this. She was a devoted mother to her children, and anxious to have more if she could have done so safely. Her family history was bad on both sides. It was decided to consult Dr. Percy Smith as to her mental condition. She was a bright, cheerful woman, with great self-control.

On January 20 Dr. Percy Smith saw her, and agreed that the pregnancy should be terminated, and that effective steps should be taken to prevent the recurrence of pregnancy. He also approved of the method suggested, as it appeared to involve the least suffering and the least strain. On January 27, 1911, supravaginal hysterectomy was performed; both ovaries and tubes, being healthy, were left. With the exception of a few hours on the second day after the operation, on which there was some evidence of depression, she made an uninterrupted convalescence, and now continues in robust health.

DISCUSSION.

Dr. MACKINTOSH had not much to add to Dr. Griffith's remarks. The patient's first labour had been tedious, terminated by forceps delivery, and she had nursed the child till the onset of melancholic symptoms. Her second labour was so quick and easy that the child was born on the sofa with the first strong pain before she could reach her bed; she had not attempted nursing, had no worries, and appeared perfectly well and cheerful until the completion of her lying-in period, when the symptoms of mental depression again appeared and

were more protracted than before. The patient was an excellent mother and took an active interest in a society for advising poor mothers how to rear their children. Since her operation, which had freed her from the menace of pregnancy with the contingencies apparently inseparable from that state in her case, she appeared extremely well and had recently won a gold medal at her club.

Dr. HERBERT SPENCER disagreed entirely with Dr. Griffith. He would not presume to criticize the artificial termination of pregnancy in this particular case, which had been decided on in consultation with a distinguished alienist; but he wished to state his opinion that it could only be very rarely that the termination of an early pregnancy was indicated for melancholia, for the reason, amongst others, that the melancholia sometimes disappeared as pregnancy advanced, and might not recur. Sir George Savage said: "In all these cases coming on during the earlier months, the less done the better . . . one thing I cannot advise, which is the induction of premature labour, for I have never seen any good follow it, and I have seen insanity follow abortion or artificial delivery."¹ What he (Dr. Spencer) criticized in the treatment was the method of terminating the pregnancy by supravaginal hysterectomy instead of by the induction of abortion. Here was a patient who was anxious to have children, but became melancholy and obsessed with the idea that she could not go through the pregnancy. After the termination of the pregnancy was decided on, instead of abortion, hysterectomy was performed, which deprived the patient of any chance of gratifying her maternal instincts, and was in itself an operation prone to give rise to insanity in patients with a predisposition thereto. Had it been advisable to remove the uterus, vaginal hysterectomy would have been simpler, and would have avoided the abdominal scar—a constant reminder of her loss, and the patient could have been sterilized by excising portions of the tubes, and even without an operation, at least for a considerable period, by the application of Röntgen rays. But he wished to express his decided opinion that neither hysterectomy nor any other form of sterilization should be employed in such a case.

The PRESIDENT (Dr. Amand Routh) agreed with Dr. Herbert Spencer's criticisms, and hoped that in the published report of his case Dr. Griffith would emphasize the fact that not only was induction of abortion rarely indicated to prevent the recurrence of melancholia after full-term delivery, but that the treatment adopted in this case (subtotal hysterectomy) was an alternative which could very rarely be entertained.

Dr. GRIFFITH, in reply, did not think that Dr. Spencer's objections to the procedure that he adopted were of much weight, and he would ask Dr. Spencer if he knew of any evidence whatever that sterility in women was produced by the medical application of X-rays. It was obvious that while in men this test could be conclusively settled, in women this was impracticable.

¹ *Trans. Med. Soc. Lond.*, 1896, xix, p. 101.

The Treatment of Puerperal Septicæmia by Bacterial Vaccines.

By G. T. WESTERN, M.D.¹

IN the course of a discussion on "Vaccine Therapy" held by the Hunterian Society in the spring of 1910, I made a preliminary report on a series of 20 cases of puerperal sepsis which had been investigated in the Bacteriological Laboratory of the London Hospital. Of these 20 cases, 13 had been treated by inoculation. Since then we have continued working on the same lines, with the result that we have now a series of 100 cases which have been investigated, and 56 of these have been treated with vaccines.

The cases in the present series have, with few exceptions, been patients admitted to the puerperal septicæmia ward at the London Hospital. These patients are drawn from the neighbouring districts after confinements in their own homes, often under the most unfavourable sanitary conditions. In many cases they have been attended by a midwife, and in others by a private doctor. It will be realized, therefore, that the present series includes only those cases which are looked upon prognostically as of such gravity as to necessitate removal to hospital. It should be added that these cases are all notified under the Act.

As I pointed out in my previous report, the very wide difference in mortality given by different authorities indicates that there is a considerable difference of opinion as to what should be included in the term "puerperal septicæmia." Clinically, a diagnosis of septicæmia rests largely on the temperature, the pulse, or a combination of temperature and pulse. Bacteriologically, a diagnosis of septicæmia may be made on a positive blood culture. If the result of blood culture is negative it does not follow that the case is not a septicæmia. It is well known that a blood culture may be done on one and the same case on several occasions and be positive one time and negative another time. Further, if several tubes of media be inoculated at the same time some may show growth while others remain sterile. Again, special precautions with regard to media or quantity and dilution of blood may give a positive culture in a case which has been negative by ordinary routine methods.

¹ From the Inoculation Department, Bacteriological Laboratory, London Hospital.

I would suggest that the explanation of these facts is that a septicæmia is not in most cases a condition in which multiplication of bacteria takes place to any great extent in the blood-stream, but rather a condition in which there is a local bacterial infection around which the tissues have not reacted to form a localizing barrier, and consequently bacteria are more or less continually being carried away into the general circulation. Here they probably do not survive very long unless they form an embolus or get caught in a thrombus, in which pyæmic abscesses may occur. If this is so we have included under the clinical term "puerperal fever" at least two different conditions:—

(1) A localized bacterial infection in the genital tract which is associated with more or less toxæmia.

(2) A local infection in the genital tract from which bacteria are being carried into the blood-stream continuously or discontinuously.

These latter cases constitute the group of true septicæmias, but it must be realized that the two groups merge into one another and, clinically, cannot always be separated, and this doubtless explains the extraordinary variations of opinion as to the mortality. The determining factors would appear to be the relative balance between the virulence of the infecting agent on the one hand and the resistance of the tissues on the other.

In tabulating the cases which we have investigated and treated, an attempt has been made to record those points which are of especial interest without making tables too full of detail to be easily read. Further, the order in which the cases have been placed has been chosen, as far as possible, to simplify the deduction of conclusions. The cases are divided into two tables:—

(1) Cases treated by vaccines.

(2) Cases untreated by vaccines.

In each table the cases which lived are grouped together, as also are those which died. Further, in each of these groups the cases in which there was definite bacteriological evidence of a blood infection are placed first.

I propose now to discuss briefly the results detailed in these tables, and at the same time a few words of explanation will be necessary about some of the headings.

NATURE OF LABOUR.

This information is of course obtained second-hand, and it will be seen that in many cases, although it is put down as "Normal," reference to the column "Other Treatment," will show that in reality it was

abnormal, in so far as there was incomplete delivery of the placenta or membranes.

Twenty-five out of the 100 cases followed on miscarriage. In only 2 of these was a history obtained of criminal interference. The number of primiparæ, 27, that is 36 per cent., if we exclude the miscarriages, or 27 per cent. including them, does not appear to be excessive, but in all probability this note is omitted in several more cases. I regret that I have been unable to obtain more precise details as to examination or interference during the various stages of labour. It would appear, however, from the number of cases in which the third stage was abnormal or incomplete, that the risk of infection in such cases is many times greater than in those where there is interference in the second stage, the reason obviously being that in the third stage there is a wound area exposed, while in the second stage manipulation takes place within the membranes.

DAY OF ONSET.

This is taken as the day on which marked pyrexia was first observed. This is noted in 81 cases, and the distribution on the various days is shown on the accompanying chart (1). It will be seen that 62 per cent. of the cases occur on the second or third day after delivery. It is also interesting to note that if we take the fatal cases alone the incidence on the second day is as great as that on the third day (11 to 11), while if we take the cases which lived, the incidence on the third day is nearly double that on the second day (18 to 10). This suggests that the more virulent the infection the more rapid will be the onset and the more fatal the result.

RIGORS.

It does not appear that any absolute prognostic significance can be attached to the presence or absence of rigors alone. Some of the most virulent and rapidly fatal cases never have a rigor at all, while others may have rigors almost daily for many weeks and eventually recover completely. It has been suggested by Schottmüller that a rigor is indicative of bacteria being thrown into the blood-stream, and, further, that the height of temperature is proportionate to the number of bacteria in the blood-stream. This is supported by the fact that a single rigor frequently occurs shortly after the operation for clearing out an infected uterus, at which time it is easily conceivable that a few bacteria are shot into the circulation. This is also in accordance with

the fact that a blood culture may sometimes show a growth if taken during or soon after a rigor, although previous cultures have remained sterile. It would seem probable, therefore, that the presence of repeated rigors denotes an improperly localized focus of infection, often septic thrombosed veins, which is the basis of a septicæmia.

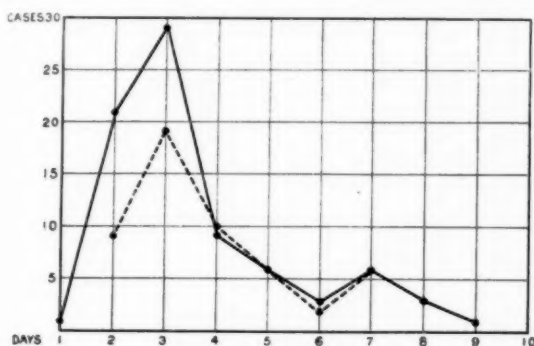


CHART 1.

Showing day of onset in 79 cases of this series, —; also in 52 cases given by Foulerton and Bonney, ----.

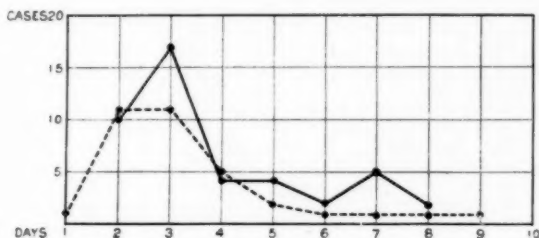


CHART 2.

Showing day of onset in 45 cases which lived, —; and in 34 cases which died, ----.

BLOOD CULTURES.

These have been made in almost every case; 8 c.c. to 10 c.c. of blood is obtained by venipuncture, and inoculated into tubes of ordinary glycerine and glucose broth. These are incubated at 37° C. for four days before being reported as negative. Some of the more recent cases have been incubated under anaerobic as well as aerobic conditions.

In 96 cases in which the blood has been examined a positive result has been obtained in 39—i.e., 40 per cent. This is clearly an underestimate of the number of true blood infections, as it will be seen that the blood examination has on several occasions been reported negative where pyæmic abscesses afford definite evidence of a blood infection. If it were possible always to take cultures during a rigor or when the temperature was at its highest point, the chances of getting a positive culture would probably be greatly increased. Of the 39 positive results 36 contained streptococci, and of these all but 2 were grown aerobically. Two cases grew *Staphylococcus aureus*, and one case grew a Gram-negative coccus which failed to grow in subculture. The two *Staphylococcus aureus* cases were both following abortion, in one instance criminally induced.

UTERUS CULTURES.

These have been taken by a method similar to one which has been used by Menge and Krönig. This is usually done in conjunction with the operation for removing retained secundines. After the vagina has been thoroughly douched the cervix is drawn down towards the vulva. This tends to straighten any flexion of the body on the cervix. A straight glass tube with a rubber diaphragm at the top is then passed up to the fundus. Having felt that its end is against the fundus it is withdrawn 1 in. Knowing, then, that we have that much space to spare we can boldly pierce the rubber membrane with a Pasteur pipette without fear of wounding the wall of the uterus. Material is then sucked into the pipette by means of a rubber teat, and on withdrawing it the tip is sealed in a flame. The material obtained is then examined by films and cultures. On withdrawing the tube the uterus may be cleared out as usual. As a further safeguard against contamination from the cervix a wider bore tube may first be passed up the cervix for 2 in., the rubber-capped tube can then be passed without touching the cervix at all. It is important that the finger be not introduced before the cultures are taken, as by so doing contaminations may be introduced, and also frequently such free hæmorrhage is set up that the specimen obtained contains little more than pure blood.

Cultures were taken from the uterus in 43 cases in this series. In 31 instances streptococci were grown in pure culture. Twice streptococci grew in large numbers together with a few colonies of coliform bacilli, which were no doubt contaminations from the vagina or cervix. On one occasion *Staphylococcus albus* alone grew, and on one occasion

the cultures were noted contaminated. In only seven cases were the results completely negative, and there is reason to believe that in some instances this was due to faulty technique. It will be seen, therefore, that streptococci occurred in 80 per cent. of the cases examined, and in 76 per cent. in pure culture.

It should be remembered that these cases have been investigated entirely with a view to possible specific treatment, and not as part of a research into the bacteriology of the genital canal in puerperal fever.

I find you have had read at this Section two papers dealing at length with this subject during the last few years. It will therefore be of interest to compare briefly my results with those obtained by the authors of those papers. I refer to a paper by Mr. Foulerton and Dr. Bonney in 1905, on "The Causation of Puerperal Infections," and one by Drs. Lea and Sidebotham, in 1909, on "The Bacteria of the Puerperal Uterus." You will remember that these workers each employed a different technique and obtained widely divergent results. Foulerton and Bonney used a glass tube with a paraffined wool cap at one end. Within the tube was a copper wire bearing a sterile swab. The tube was passed through the cervical canal, the paraffined cap pulled off by means of a string. The wire with the swab attached to it was then advanced to the fundus and withdrawn again into the tube. The apparatus was then removed, with the swab inside, and plugged at each end. Lea and Sidebotham used a glass tube which was passed up to the fundus, suction being then applied by means of a syringe. It appears to me that the former technique is good, while the latter could not be expected to give reliable results.

Turning to their results, briefly, Foulerton and Bonney found: (1) In 12 cases of normal puerperium examined, 100 per cent. sterile. (2) In 40 cases of severe puerperal infection examined, 80 per cent. had bacteria present. (3) In these 40 cases streptococci or Gram + diplococci were present in 77.5 per cent. On the other hand, Lea and Sidebotham examined the contents of the uterus in 58 cases of normal puerperium and found bacteria present in 80 per cent. In these 46 cases 120 bacteria were found, an average of 2.8 varieties per case. If we compare this with the 100 per cent. sterile results, quoted above, it appears to me that imperfect technique is the only possible explanation of the difference. The point is important for this reason: if the uterus normally contains numerous bacteria during the puerperium it is clearly futile to waste time isolating pathogenic from non-pathogenic bacteria for the purpose of making a vaccine to treat a severe septicæmia. Our

results, which I have already quoted, show that we can obtain a pure culture from the puerperal uterus in 76 per cent. of infected cases. This appears to me to be strong evidence against the correctness of Lea and Sidebotham's results.

It may sound paradoxical, but every bacteriologist will agree, that while it is impossible to get a pure primary culture of one organism in 76 per cent. of cases if, in reality, a mixture is present in the material planted out, imperfect technique is all that is required to enable a mixture of bacteria to grow when in reality only one is present in the material we are intending to examine. I would submit, therefore, that if it is possible to grow a pure culture of one organism from the uterus (which is normally sterile) in 76 per cent. of morbid cases, we have strong evidence that this is really the infecting agent.

Before leaving this heading, it is interesting to note that Foulerton and Bonney's 77.5 per cent. of Gram + streptococci and diplococci very closely coincides with our 80 per cent., although they do not appear to have obtained pure cultures in so many cases.

VACCINES.

Under this heading is indicated whether the case was treated with an autogenous vaccine, or whether a "stock" was used—i.e., a vaccine prepared from a culture obtained from another patient. I have, wherever possible, used an autogenous vaccine. Only where no culture has been obtainable, or where the preparation of an autogenous vaccine is not yet complete, have "stock" vaccines been used. Some cases which have been commenced on a "stock" vaccine and have shown no improvement after several injections, have then been given an autogenous vaccine and have at once responded by a marked fall in temperature and general improvement. I consider, therefore, that an endeavour should be made to obtain an autogenous vaccine from the first in all cases and no valuable time be lost in extensive trials of "stock" vaccines.

With regard to the source from which the vaccine should be made, theoretically an organism obtained from the blood-stream is more certain to be the offender than one obtained from the uterus, which is, of course, more open to contaminations. Practically, however, there are some very real advantages in the latter source. Firstly, our figures show a negative result in 60 per cent. of cases of blood culture, whereas cultures taken from the uterus are found to give negative results in only about 20 per cent. of cases, and even this could doubtless be reduced if these cultures were always taken by or under the direction of one

accustomed to the technique. Secondly, a proportion of blood cultures show no growth until after two or more days have elapsed. Cultures from the uterus, on the other hand, almost invariably show growth within twenty-four hours, if they are going to grow at all. Further, as the tables show, we can get pure cultures from the uterus in 76 per cent. of cases examined, so that in this percentage a vaccine can be prepared within twenty-four hours of taking our cultures. This is seldom possible from blood cultures, as in them it is only very exceptionally possible to make up a vaccine from the primary culture. I would urge, therefore, that if a case is at all serious and the uterus is being explored the opportunity of taking cultures at the same time by some reliable method should never be missed, as this may afterwards be an irretrievable loss.

OTHER TREATMENT.

Under this heading falls operative interference for the removal of secundines, evacuating pus, &c. Also the administration of antistreptococcus serum. This latter has been given in 18 cases, sometimes in conjunction with and sometimes without vaccines. Of these 18 cases 7 lived and 11 died. We have not noted any cases where antistreptococcus serum appeared, by itself, to have any marked effect in lowering the temperature or improving the general condition. On the other hand, in one case we have seen antistreptococcus serum given in 20 c.c. doses and repeated for eight doses, and after almost every dose the temperature ran up 2° to 3° F. This patient eventually recovered after the injections were discontinued. This case very strongly suggested that there was in the serum a distinct toxic element.

RESULTS.

It is difficult, or perhaps even impossible, to estimate accurately the benefit derived from any special line of treatment without having for comparison a sufficient number of control cases. These are not at present available.

The 44 cases in this series which have not been treated by vaccines cannot, without reserve, be taken as controls, as they include many mild cases which were not treated because it was considered that they would do well without. In cases where an autogenous vaccine had been prepared it was withheld if the temperature was already falling. Further, as was pointed out by the British Medical Association Committee appointed in 1905 to consider the question of puerperal morbidity, an efficient comparison of the statistics from various

hospitals is impossible, owing to diversity of standards of morbidity. The standard suggested by that committee includes all cases where the temperature reaches 100° F. on any two of the bi-daily readings from the first to the eighth day after delivery. Whitridge Williams, in a series of 92 cases of puerperal infection, had a mortality of 15 per cent., but, as he adds, "our favourable results are probably attributed to the fact that many mild cases are included in our series which would have escaped detection except for the bacteriological examination of the lochia of all febrile cases"; and again, "In my practice such a procedure forms a part of the routine examination in every case presenting a rise of temperature above 101° F." The present arrangement of the Septicæmia Ward in this Hospital did not exist previous to the commencement of this series of cases, so that it is not possible to obtain a control series from that source.

Perhaps some idea of the type of case we have been dealing with can be gathered from the temperatures. It is, of course, not practicable to show the charts of 100 cases; I have therefore grouped them according to their maximum temperatures, taking the maximum as the highest temperatures which have been reached apart from single rigors.

MAXIMUM TEMPERATURES.

107° F.—108° F.	...	...	...	2.6 per cent.
106° F.—107° F.	...	...	...	6.6 "
105° F.—106° F.	...	...	...	32.0 "
104° F.—105° F.	...	...	...	28.0 "
103° F.—104° F.	...	...	...	22.6 "
102° F.—103° F.	...	...	...	6.6 "

Of the cases whose maximum was between 102° F. and 103° F., only one was considered sufficiently grave to require vaccine treatment.

By the courtesy of Dr. Newsholme I have obtained from the Local Government Board the returns for the last few years of the notified cases of puerperal fever for some 250 odd boroughs and urban districts, having a total population of about 19½ million people. Calculating from these the mortality per million living, I have compared the figures so obtained with the death-rate from puerperal septic diseases per million living for the whole of England and Wales, obtained from the Report of the Registrar-General. From this I find that the mortality of notified cases varies between 57 per cent. and 62 per cent. (*See Table III.*)

These figures coincide very closely with those published by your President in his address last October. Taking the notified cases of puerperal fever and the deaths from puerperal septic diseases in the Administrative County of London during the years 1906-10, he arrives

at the death-rate of 58·7 per cent. In the same paper Dr. Routh gives another table showing that for the first six months of 1911 there were 145 cases notified in the Administrative County of London, having a death-rate of 46·9 per cent. It is interesting to note that in the same period there were in the London Hospital 28 cases notified (and therefore included in Dr. Routh's figures) having a death-rate of 25 per cent.

TABLE III.

Year	Boroughs and urban districts	Population (1901)	Cases of puerperal fever notified	Cases notified per million living (1901)	Deaths per million living, England and Wales	Mortality
1906	258	19,437,867	1,467	75	47	62·6 per cent.
1907	257	19,432,397	1,394	71·7	41	57 „
1908	259	19,458,754	1,323	67·9	39	57·4 „
1909	258	19,432,190	1,357	69	40	57·9 „
1910	253	19,532,548	1,340	68	—	—

The mortality shown in Table III appears to coincide fairly accurately with the mortality amongst the untreated cases in the series we are considering—namely, 55 per cent.—if we remember that amongst these are included an excess of the milder cases which reduce the mortality.

I desire, however, without placing too much importance on these figures, to put our results on record and to indicate briefly what appear to me to be justifiable conclusions.

Of the 56 cases treated, 38 lived, while 18 died, giving a mortality of 32 per cent.

Of the 44 cases untreated, 20 lived, while 24 died, giving a mortality of 55 per cent.

As I have already stated, these are not strictly comparable cases, as those untreated include on the one hand a few of the severest cases, where death occurred before any specific treatment could be commenced, and on the other hand many comparatively mild cases. The bias, however, is rather towards lowering the mortality amongst the uninoculated owing to the excess of the mild cases.

More valuable evidence can, however, be obtained if we consider those cases only where there was definite bacteriological evidence of a blood infection. By this I mean either a positive blood culture or pyæmic abscesses from which a streptococcus was obtained in pure

culture. Amongst those treated there were 28 such cases, Nos. 1-13 and 39-53.

No. 52 did well for a time and had a normal temperature for a week. She was then allowed up. On the second day of getting up she was suddenly taken ill and died in half an hour of heart failure. I omit this case, therefore, from my figures. Of the other 27 cases, 13 lived (1-13) and 14 died (39-51, 53), giving a mortality of 52 per cent. It should be noted that amongst these 14 cases counted as treated and died are included 6 which only received a single dose of a vaccine within twenty-four hours of death.

Turning now to the similar series of untreated cases, we have 16 examples—Nos. 57, 58, 77-89, 95. Of these 2 lived (57, 58) and 14 died (77-89, 95), giving a mortality of 87.5 per cent. Further, if we confine ourselves to streptococcal cases, we have 12 out of 13 cases untreated dying—mortality, 92 per cent. It would appear, therefore, that treatment by inoculation with autogenous vaccines in this series of cases has reduced the mortality by 30 to 40 per cent. How far this will be borne out in larger series of cases will be seen in the future, but these figures suggest that the benefit is sufficient to justify a continued and more extended trial of the treatment.

The length of time occupied in the treatment of these cases is a question which doubtless will be asked. Roughly speaking, it appears from our series that the cases may be divided into three groups.

(1) Those which respond at once to an inoculation of a vaccine, the temperature falling to normal within forty-eight hours. Case 3 is a good example of this. Previous to inoculation there were streptococci in the blood-stream and the temperature had varied between 101° F. and 104° F. for four days. Following on the first inoculation the temperature fell; within twenty-four hours the maximum was 102° F., and in forty-eight hours it was normal. Recovery was uninterrupted.

(2) They may respond to each of a series of injections, the average of the six four-hourly temperatures falling a degree or so. Case 15, whose chart is given below, shows this well.

(3) Temperature may steady until the daily maximum is not above 102° F. Further injections fail to reduce this. In these cases there is probably a local collection of pus which must be found and drained, the temperature will then quickly fall to normal. No. 12 illustrates this well. Previous to inoculation she had seventeen rigors in sixteen days; the daily temperature varied between 100° F. and 106° F. After the first injection the rigors ceased entirely, and the temperature

subsided until the daily maximum was 102° F. It remained thus for three weeks, further injections having no influence. An abscess then pointed in the buttock; on opening and draining this the temperature fell to normal, and did not rise again.

CONCLUSIONS.

(1) The mortality amongst those cases of puerperal septicæmia in which there is definite bacteriological evidence of bacteria in the blood-stream is from 85 to 95 per cent.

(2) This mortality may by inoculation with autogenous vaccines be reduced to about 55 per cent.

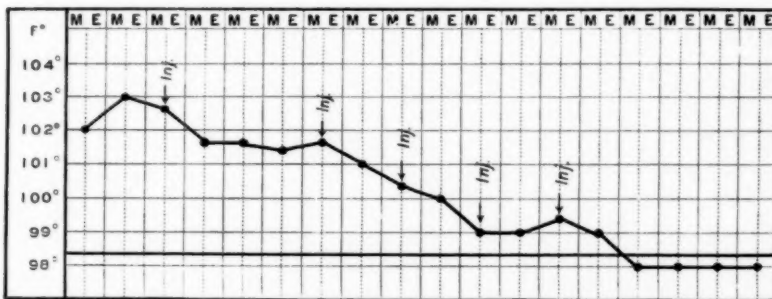


CHART 3.

Showing the mean of the six four-hourly temperatures and spacing of injections of vaccine.

(3) The mortality amongst notified cases of puerperal fever is about 60 per cent.

(4) This mortality may by inoculation with appropriate vaccines be reduced to about 33 per cent.

(5) In cases of puerperal sepsis, if it is decided to explore the uterine cavity the opportunity of obtaining a culture at the same time should not be lost.

(6) In the treatment of puerperal sepsis "stock" vaccines give inferior results, and should only be used when an autogenous vaccine cannot be obtained.

I desire, in conclusion, to express my thanks to Dr. Russell Andrews, under whose care the majority of the cases have been; also to some other members of the Staff of the London Hospital for permission to make use of cases under their care. Further, my thanks are due to Dr. W. Bulloch, in whose laboratory I have carried out this work.

TABLE I.

NOTE.—The figures in parentheses indicate the day after labour on which vaccine treatment was commenced, uterus cleared out, &c.

No.	Nature of labour	Day of onset	Cultures		Vaccines	Other treatment	Result	Complications and remarks
			Rigors	Blood				
1	Primipara; normal	Fourth	+	Streptococcus	Streptococcus	Uterus explored; abscess opened (14)	Lived	Pyæmic abscesses; osteomyelitis of femur
2	Normal	Fifth	...	"	"	Uterus cleared out (5)	"	"
3	Primipara; instruments	Second	+	"	"	Anti-streptococcus serum (8)	"	"
4	Primipara; instruments	...	+	"	"	...	"	"
5	II. para; born before doctor's arrival	Third	+	"	"	Abscesses drained; uterus cleared out (10)	"	Pyæmic abscesses containing pure streptococcus; infarcts in lungs and kidneys
6	Primipara; normal	Second	+	"	"	Abscess drained	"	Pyæmic abscesses; coli cystitis
7	Primipara; post-partum hæmorrhage; retained placenta	Eighth	+	"	Streptococcus	Uterus cleared out (9)	"	"
8	Six weeks' miscarriage	Twenty-second	+	Streptococcus (anaerobic)	"	Uterus cleared out (29)	"	"
9	Primipara; normal	Third	+	Streptococcus (anaerobic)	"	...	"	Thrombosed veins in legs
10	Incomplete miscarriage	...	...	Staphylococcus aureus	Staphylococcus aureus (14)	Uterus cleared out (12)	"	"

11	Retained secundines	Third	+	Negative	Auto-streptococcus (11)	Abscesses drained	"	Pyemic abscesses in back, calf and wrist-joint, containing pure streptococcus
12	Normal	Sixth	+	"	"	Abscesses drained; knee aspirated	"	Vaccine from knee-joint culture; pyemic knee-joint; parametritic abscess; embolus of retinal artery
13	Normal; seven and a half months	Third	+	Not done	Stock streptococcus (15)	Abscesses drained	"	Pyemic abscesses and pulmonary infarcts
14	Normal	Seventh	...	Negative	Auto-streptococcus (16)	Uterus cleared out (15)	"	Pleurisy and ? pericarditis
15	Placenta previa	Third	+	"	" (7)	Uterus cleared out (5)	"	
16	Two months' miscarriage	...	+	"	"	Uterus cleared out	"	
17	Normal	Second	+	"	" (10)	Uterus explored (9); laparotomy	"	Encysted pus in pelvis
18	Primipara; normal	Third	+	"	" (13)	Uterus cleared out (12)	"	
19	Born before doctor's arrival	Third	+	"	" (12)	Uterus cleared out (11)	"	
20	Premature rupture of membranes	Third	+	"	" (7)	Anti-streptococcus serum (7)	"	
21	Primipara; normal	Third	...	"	"	Uterus cleared out	"	Parametritis
22	Normal	...	...	"	"	...	"	Parametritic abscess discharging into bladder
23	Primipara; instruments	Fifth	...	Not done	"	...	"	
24	Primipara; instruments	...	+	Negative	" (21)	Uterus explored (19)	"	
25	Instruments	...	+	"	Stock streptococcus (12)	...	"	
26	Three months' miscarriage	Fifth	+	"	" (11)	...	"	
27	Normal	Second	+	"	" (19)	...	"	
28	Primipara; instruments	Third	...	"	" (5)	Anti-streptococcus serum (5)	"	
29	Primipara; normal	Fifth	+	"	" (18)	...	"	

TABLE I—(continued).

No.	Nature of labour	Day of Onset	CULTURES		Vaccines	Other treatment	Result	Complications and remarks
			Blood	Uterus				
30	Six weeks' miscarriage	...	"	Negative	Stock streptococcus (7)	Uterus cleared out (5)	Lived	
31	Normal	Second	"	Not done	" (11)	Uterus cleared out (7)	"	
32	Incomplete miscarriage	...	"	"	" (14)	Laparotomy	"	General peritonitis
33	Normal	Second	"	"	" (7)	...	"	
34	Primipara; normal	Third	"	Streptococcus	"	Uterus cleared out	"	
35	Placenta prævia	Second	"	Not done	"	...	"	Venous thrombosis in leg
36	Retained placenta	Third	"	Streptococcus	" (12)	Uterus cleared (8); abscess opened	"	Abscess in abdominal wall: cultures, streptococcus and staphylococcus
37	V-para; normal	Second	"	Not done	" (6)	Uterus cleared out (4)	"	Temperature fell, twelve hours after vaccine, three days after uterus was cleared out
38	IV-para; retained placenta	Sixth	"	"	" (14)	...	"	
39	Excessive bleeding	Fourth	Streptococcus	Streptococcus	Auto-streptococcus (17)	Knee-joint and abscesses drained (41)	Died (39)	Post mortem: Pyæmia; endocarditis; venous thrombosis
40	Normal; seventh month	Second	"	"	" (10)	Anti-streptococcus serum (8)	Died (42)	One dose vaccine; fifteen doses anti-streptococcus serum. Post mortem: Ulcerative endocarditis
41	Three months' miscarriage	Third	"	Not done	" (32)	Anti-streptococcus serum (19); uterus explored (3); joints drained	Died (40)	Post mortem: Pyæmia
42	Multipara; normal	Fifth	"	Negative	Stock streptococcus (10)	Uterus cleared out (8)	Died (11)	Died thirty-six hours after admission; one dose stock vaccine. Post mortem: Pus in both knees and one elbow; purulent endometritis

43	<i>Ante-partum</i> prolapse	Third	...						General peritonitis; empyema	
44	Dead; hydro- cephalus; three days' labour	Fourth	+	"	"	Not done	Auto-strepto- coccus (8)	Peritoneal cavity drained (11)	Died (21)	Died forty-eight hours after vaccine com- menced. Post mortem: Septic thrombosis of uterine vein; pyosalpinx; peritonitis
45	Primipara; normal	Third	+	"	"	Negative	" (15)	...	Died (17)	
46	Primipara; normal	Third	+	"	"		" (21)	Uterus explored; nil found (17)	Died (39)	Purulent thrombosis of internal and external iliac veins, uterine veins and vena cava up to level of renal veins
47	Primipara; instruments	Third	+	"	"	Strepto- coccus	Stock strepto- coccus (21)	Anti-strepto- coccus serum (21)	Died (22)	Died twenty-four hours after admission; one dose stock vaccine
48	Incomplete miscarriage	...	...	"	"	Not done	" (6)	Anti-strepto- coccus serum (6)	Died (7)	Died twenty-four hours after admission; one dose stock vaccine; septic thrombosed vari- cose veins
49	Incomplete miscarriage	...	...	"	"	"	" (13)	Uterus cleared out (13); lapa- rotomy; anti- streptococcus serum	Died (17)	Pelvic peritonitis; cultures streptococcus
50	Primipara; <i>post-partum</i> hemorrhage	Third	...	"	"	Strepto- coccus	Auto-strepto- coccus (9)	Uterus cleared out (7)	Died (10)	Died twenty-four hours after vaccine ready. Post mortem: Cerebral abscess
51	III-para; adhe- rent placenta	Second	-	"	"	"	Stock strepto- coccus (6)	Uterus cleared out (5)	Died (7)	Died twenty-four hours after admission; one dose stock vaccine
52	V-para, eighteen hours' labour	Third	+	"	"	"	Auto-strepto- coccus (10)	Placenta removed (9)	Died (11)	No post-mortem; blood culture seven days after onset
53	Two months' abortion	Seventh	+	Negative	"	Not done	" (4)	Uterus cleared out (3)	Died	Temperature normal for one week; patient up two days; death from ? heart failure or detached thrombus; no post-mortem
54	Primipara; instruments	Fourth	...	"	"	"	Stock strepto- coccus (23)	Uterus cleared out (13)	Died (32)	One dose stock vaccine. Post mortem: Utera- tivo endocarditis; infarcts in spleen and kidneys; hydrops
55	Primipara; instruments	Ninth	+	"	"	Strepto- coccus	" (12)	Peritoneum drained by vagina (13)	Died (14)	Died forty-eight hours after admission; one dose stock vaccine; no post-mortem
56	Normal	Third	+	"	"	Not done	Auto-strepto- coccus (13)	Uterus cleared out (12)	Died (23)	Post mortem: Purulent endometritis
				"	"		Stock strepto- coccus (11)	Uterus cleared out (9)	Died (28)	Post mortem: Empyema

TABLE II.

NOTE.—The figures in parentheses indicate the day after labour on which vaccine treatment was commenced, uterus cleared out, &c.

No.	Nature of labour	Day of onset	CULTURES		Vaccines	Other treatment	Result	Complications and remarks
			Rigors	Blood	Uterus			
57	Normal	Fourth	+	Strepto- coccus	Not done	Nil	Uterus explored; anti-streptococcus serum (5)	Lived
58	Primipara; instruments	Third	+	? Gono- coccus (9)	"	"	Uterus explored (5)	"
59	Primipara; ruptured perineum	Third	...	Negative	Strepto- coccus	"	Uterus cleared out (16)	"
60	Three months' miscarriage	"	...	Not done	Strepto- coccus	"	Uterus cleared out (13)	"
61	Two months' miscarriage	Third	...	Negative	Negative	"	Uterus cleared out (7)	"
62	Normal	Seventh	...	Not done	Strepto- coccus	"	Uterus cleared out (5)	"
63	Post-partum hæmorrhage	Second	...	Negative	Not done	"	Uterus cleared out (4)	"
64	Normal	Seventh	...	"	"	"	Uterus cleared out (7)	"
65	Four months' miscarriage	Fourth	+	"	"	"	Abscess drained	"
66	Three months' miscarriage	Eighteenth	+	"	Negative	"	Uterus cleared out (24)	"
67	Normal	Second	+	"	Strepto- coccus	"	Uterus cleared out (3)	"
68	Normal	Third	...	"	Contaminated	"	"	"
69	Two months' miscarriage	Fourth	+	"	Not done	"	"	"
70	Normal	Third	...	"	"	"	Credé ointment	"

71	Incomplete miscarriage	...	..	Staphylococcus aureus	..	Uterus cleared out (14)	..	Temperature fell rapidly
72	Instruments	Second	...	Not done	..	...	..	Laceration of cervix; mild case
73	Primipara; normal	Seventh	+	..	..	Anti-streptococcus serum	..	Mild case
74	Normal	Third	+	..	..	Uterus cleared out; anti-streptococcus serum	..	Laceration of cervix; mild case
75	Normal	Eighth	+	..	..	Anti-streptococcus serum	..	Mild case
76	Criminal abortion	...	+	..	..	Uterus cleared out (5)	Died (7)	Post mortem: Abscess in broad ligament; peritonitis
77	Normal	First	+	Streptococcus	..	...	Died (17)	Post mortem: Thrombosis left internal and common iliac veins
78	Normal	Fourth	..	..	..	...	Died (7)	Septic broncho-pneumonia
79	Primipara; normal	Second	...	..	..	Uterus cleared out (10)	Died (21)	Post mortem: Endocarditis; peritonitis; septic embolus in lung
80	Incomplete miscarriage	Second	+	..	..	...	Died (36)	Post mortem: Pelvic cellulitis; thrombosis of ovarian veins; pyæmic abscesses in lungs
81	Three months' miscarriage	Second	+	..	..	...	Died (14)	Post mortem: Peritonitis
82	Instruments	Second	..	..	..	...	Died (48)	Post mortem: Osteomyelitis of pubic bones
83	Born before doctor's arrival	...	..	..	..	...	Died (7)	Post mortem: Sloughing endometritis; peritonitis
84	Incomplete miscarriage	Second	...	..	..	Anti-streptococcus serum (4)	Died (14)	No post mortem
85	Primipara; instruments	Fourth	+	Streptococcus	..	Uterus cleared out (10); anti-streptococcus serum (10)	Died (4)	Pure streptococcus in peritoneal pus; died twenty hours after admission, second day after onset
86	Multipara	Second	-	Not done	..	Peritoneal cavity drained (3)	Died (6)	Post mortem: Recent endocarditis
87	Incomplete miscarriage	Third	+	..	..	Uterus cleared out	Died	No post mortem
88	Primipara; normal	Sixth	+	..	..	...	Died (14)	Post mortem: Pyæmic abscesses in lungs and myocardium
89	Criminal abortion	Fifth	+	Staphylococcus aureus	..	...	Died (14)	

TABLE II—(continued).

No.	Nature of labour	Day of onset	CULTURES		Vaccines	Other treatment	Result	Complications and remarks
			Rigor	Blood	Uterus			
90	Retained secundines	Seventeenth	+	Negative	Not done	Uterus cleared out (2)	Died (34)	Post mortem: Purulent parametritis; thrombosis of internal iliac veins
91	Normal	Second	+	"	Negative	Uterus cleared out (5); anti-streptococcus serum	Died (9)	Post mortem: Purulent endometritis; salpingitis; abscess in left ovary
92	Instruments	Second	+	"	Streptococcus	Uterus cleared out (14)	Died (15)	Died twenty-four hours after admission
93	Retained secundines	...	+	"	"	Uterus cleared out (14); anti-streptococcus serum	Died (34)	Post mortem: Pericarditis; purulent thrombosis of both uterine and common iliac veins; multiple emboli in lungs
94	Primipara; instruments	Second	+	"	Not done	...	Died (23)	Almost moribund on admission. Post mortem: Thrombosis of uterine and ovarian veins
95	Post-partum hæmorrhage; retained placenta	Second	...	"	"	Uterus explored; nothing found (8)	Died (18)	Post mortem: Septicæmia; pyæmic abscesses in kidneys
96	Four months' miscarriage	Third	+	"	Cocci seen; nil grew	Uterus cleared out (5)	Died (16)	Numerous rigors for nine days before death
97	Primipara; normal	Third	...	"	Streptococcus	Anti-streptococcus serum	Died	General peritonitis and empyema
98	Six weeks' miscarriage	Twentieth	+	"	Not done	Uterus explored (20); anti-streptococcus serum	Died (21)	Numerous rigors
99	Four months' miscarriage	...	+	"	Negative	Uterus cleared out (22); abscesses drained	Died (93)	Parametritic abscess
100	Eight months' stillborn	Eighth	+	"	Not done	Uterus cleared out (12)	Died (50)	Cystitis; numerous rigors

DISCUSSION.

Dr. WILLIAMSON wished to thank Dr. Western for bringing so important a subject before the Section. Any method of treatment which lowered the mortality of puerperal infection called for earnest attention and for constant and unremitting investigation. Our knowledge had grown slowly, but had now reached a stage which made it clear that we must consider not merely the methods by which infecting organisms might be excluded from the puerperal uterus, but also the methods by which the resistance of an infected person might be raised. To the latter of these two problems Dr. Western's paper was a valuable contribution. The title of the paper was misleading, for many of the cases recorded were not cases of septicæmia in the sense in which obstetricians employed that term; it was therefore necessary in the first place to exclude all those cases in which a blood culture had not proved positive. He agreed with Dr. Western that the finding of organisms in the patient's blood did not necessarily imply that those organisms were growing and multiplying in the blood-stream; in a case of septic endometritis, for instance, doubtless bacteria were constantly passing into the general circulation in greater or less numbers, in some cases their presence in the blood-stream was a mere temporary phenomenon, for they were destroyed and rendered powerless for evil; in other cases they grew and multiplied, causing a general infection. The condition of the patients in the former group was one of bacteriæmia, in the latter group of septicæmia. Could the two be distinguished from one another? Dr. Mervyn Gordon, who had recently been devoting great attention to the subject in the wards of St. Bartholomew's Hospital, attached considerable importance to the number of blood cultures in which the organism could be found and to the number of colonies grown. If five or six blood tubes (the blood being preferably taken from two or more different veins) all gave positive cultures and numerous colonies were grown, the prognosis was generally bad; if only one or two tubes grew and the growth was scanty the prognosis was more favourable. Dr. Williamson had investigated two other points with a view to prognosis, first the white blood count and secondly the extent to which hæmolysis took place. Generally speaking, a high white count was a favourable point in the prognosis, whilst a falling red blood count was unfavourable, but it must be added that the patient who had the lowest red blood count in the whole series recovered. Septicæmia often developed in patients whose resistance had been lowered by *ante-partum* or *post-partum* hæmorrhage, so that no reliance must be placed on a single count, but when from day to day the number of red blood corpuscles was diminishing the prognosis was usually very unfavourable. Dr. Western's tacit assumption that the uterus was normally sterile throughout the puerperium (based upon the facts that various workers upon the bacteriology of the puerperal uterus in afebrile cases had obtained very different results, and that one or two had found the uterine cavity almost invariably sterile) could not be allowed to pass unchallenged. When even the most perfect technique was adopted the balance of evidence was overwhelmingly in favour of the view that from the sixth day of the puerperium streptococci were present in the uterine cavity in from 15 to 20 per cent. of the afebrile cases, although they were

absent on the earlier days. It was useless to quote any series of cases unless the day on which the cultures were taken were stated, and the discrepant results obtained by different workers were in many instances to be attributed not to faulty technique but to the different stages of the puerperium at which the observations were made. In streptococcal vaccine therapy the first principle to be laid down was that the vaccine must be autogenous. Sufficient work had been done upon the differentiation of streptococci to show that the use of a stock vaccine was irrational. A vaccine took at least forty-eight hours to prepare (for he totally disagreed with Dr. Western that it was justifiable to inject a vaccine without being sure that it was sterile), and during this forty-eight hours much valuable time was lost. In order to obviate this difficulty his practice was to employ both a serum and a vaccine. As soon as the intra-uterine smear preparations disclosed the presence of a streptococcus, 25 c.c. of the anti-pyogenes serum were injected subcutaneously, the dose was repeated at the end of twelve and again at the end of twenty-four hours and when the uterus was cleared out its walls were swabbed over with the same serum. Some elements, antitoxic or bactericidal, were lacking in the blood of these patients, and it was a rational and scientific method of treatment to attempt to supply them by this means. As soon as the autogenous vaccine was prepared it was given in increasing doses, commencing usually with 5 million bacteria, and in some cases going up to 100 million. The doses were repeated at intervals of forty-eight to seventy-two hours. He had reason for believing that since this method of treatment had been adopted the mortality had been lowered, but he hoped that shortly Dr. Mervyn Gordon and himself would place before the Section their series of cases.

Dr. INGLIS PARSONS thought that Dr. Western's paper would have been of much greater value if he had stated the dose of vaccine in each case, and also if he had described his reasons for using vaccines. In his experience there were a good many cases in which vaccines were contra-indicated and might do more harm than good. For instance, a patient might be absorbing from the infecting lesion as much toxin or more than she could stand. Under these conditions an antiserum was indicated. If, on the other hand, a full dose of vaccine was given it might produce a prolonged negative phase, with disastrous results to the patient. Unfortunately they were not in a position at present to gauge the condition of the blood in acute cases, so as to know whether to give a vaccine or not. Even if the opsonic index were taken by an expert and found to be much below normal, they were still in the dark as to whether this was a negative phase from a large dose of auto-absorption of toxins, or whether it was not a negative phase, but a normal low position of the opsonic index. If the former an antiserum was the best treatment, if the latter a vaccine was indicated. He hoped that before long the chemists would find some test of the blood to indicate the difference between the two conditions. He was inclined to think, from the result of clinical observations, that in all cases where there was a high temperature the patient was absorbing as much toxin as she could stand, because injections of vaccine often made them worse; when, however, the condition showed a tendency to become chronic, vaccines would in a large number of cases cure the patient.

The PRESIDENT (Dr. Amand Routh) congratulated Dr. Western upon his successful treatment of the 56 cases in his Table I, which showed that in the cases treated by vaccine only 18 out of 56 died (32 per cent.), whereas in those not treated by vaccine 24 died out of 43 (or 56 per cent.). The duration of life, too, of those who died after vaccine treatment averaged twenty-three and a half days, whilst those who had no such treatment died after an average of only twenty-two days. Dr. Routh did not think, however, that Dr. Western had proved his point that vaccine therapy was of much service in true puerperal septicaemia. Dr. Routh believed that vaccine therapy was useful in cases where puerperal infection of the uterine mucosa or of lacerated areas was already localized by exudation in the uterine muscle (metritis) or around it (peri- and parametritis). In such cases the infecting organism was surrounded by an exudation of protective cells, and whilst there was a general toxæmia there was no general septicaemia. By the administration of a suitable vaccine—i.e., the injection of so many million of the needed type of bacteria—the formation of antibodies was stimulated, and some of these penetrated through the protective exudation. Owing to the injected bacteria being dead there was no fear of septicaemia being produced. If there was true general septicaemia, and if bacteria were found in the blood, presumably stimulating the tissues to the utmost to form antibodies, the addition of further bacteria, even dead ones, seemed unlikely to do good. Dr. Western's results seemed to bear out these views, for most of the cases treated by him came under observation and were treated by vaccine more than ten days after infection. Clearly these stood a good chance of recovery under any method of treatment. The really severe cases died within ten days after infection. Thus out of the 29 cases where details were given in Table I out of the total of 38 cases which recovered, vaccine therapy was commenced on or after the tenth day in 21 cases, by which time all the most severe cases would have already succumbed. In those same 38 cases which recovered it was also stated that abscesses, some pelvic or primary, others pyæmic or secondary, were opened and drained in 10 cases, showing that the infection was to some extent localized. The vaccine treatment no doubt helped to prevent generalization. This was also confirmed by the fact that among the 18 cases in Table I which died there was no case of primary localization, and the only case where the infection was at all localized, where abscesses were drained, was a patient with pyæmia, with abscesses of the knee-joint, &c., who died on the fifty-ninth day. Again, Dr. Western only succeeded in finding the infecting organism in the blood in 10 cases out of the 38 in Table I which recovered (26 per cent.), but found them in 14 out of the 18 cases which died (77 per cent.). In Table II, where vaccine was not used, organisms were only found in 1 case out of 20 recovering cases (5 per cent.), but in as many as 13 out of 24 cases that died (54 per cent.). These points tended to show that the cases which recovered were mainly those of localized infection, whilst the cases which died were mainly true septicaemia. He would like to ask Dr. Western how long it took to prepare an autogenous vaccine and whether there was any clinical method of determining whether a vaccine was doing good—in other words, what "reaction" ought to be present? If there was no visible reaction to show that a combat was going on between the home defence of opsonized lymph and

the injected dead micro-organisms was it useless or dangerous to continue the vaccine? Or were we to rely mainly upon the absence of reaction and the subsequent improvement of the patient rather than on the presence or severity of the reaction? At present the clinical functions of the physician and the duties of the bacteriologist were too much divorced. Either the physician must become conversant with much of the theoretical knowledge of the bacteriologist so as to be able to estimate the dosage, the indications for repeated doses, the significance of reaction after the dose, and so on, or the bacteriologist at a general hospital should have clinical functions and be appointed clinical bacteriologist or even physician-bacteriologist. Further experience was needed to show if vaccine therapy was useful in true septicæmia. Meanwhile, Dr. Western had clearly shown its value in localized infection, and the hearty thanks of the Section were due to him for his painstaking and accurate communication.

Dr. W. W. C. TOPLEY said that he merely wished to offer a few criticisms on certain points raised in the course of the paper. He would like to ask whether any attempt had been made to differentiate the various streptococci isolated, culturally or otherwise. We knew that the various strains of streptococci varied greatly in virulence, and it would be of interest to know the actual organisms involved in the cases included in the paper. With regard to those cases in which no organism had been isolated, and a stock streptococcal vaccine had been employed, he could not see that they supplied evidence of any value. He wished, especially, to differ from the statement that an autogenous vaccine could safely and properly be prepared in twenty-four hours without any subcultures being taken to ensure sterility; and he was quite unable to agree with the opinion expressed by Dr. Western that it was probably a matter of indifference if a few living organisms were introduced into the tissues of a patient suffering from a septicæmia. A few living organisms introduced at any given moment would represent an unknown number after the lapse of a short interval, and under such circumstances any attempt at dosage was impossible, apart from the fact that there was, in his opinion, no justification for a mode of procedure involving the risk of introducing into the patient's tissues living and virulent bacteria. He did not himself hold the opinion that the most reliable method of judging the effect of treatment, by vaccines or otherwise, was by the use of statistics, especially where the number of cases on which such statistics were based was necessarily limited. It was extremely difficult to obtain a series of strictly comparable cases, or to allow for the incidence of factors quite unconnected with the method of treatment. He, personally, considered that information of the greatest value could be obtained by watching individual cases. His own experience of cases of this nature had been very small, but he had certainly seen cases which were going steadily from bad to worse recover under the use of an autogenous vaccine, while in others the treatment seemed to have no effect. The argument that the improvement following the inoculation of a vaccine was a mere coincidence was not an answerable one, nor did he think it needed answering. If it were the general experience of those who employed vaccines in such cases that in a proportion of them this method of treatment was followed by immediate improvement and ultimate recovery in cases which had refused to respond to other methods,

or which would have been regarded as having from their nature a very grave prognosis, then the case for giving vaccines a trial was sufficiently made out.

Dr. BLACKER would like to ask the author of the paper two questions: Firstly, what did he exactly mean when he spoke of puerperal septicæmia; and secondly, had he tried the effect of simultaneous inoculations into several different parts of the body, the so-called summation treatment as originally recommended by Sir Almroth Wright.

Dr. WESTERN, in reply, said that his definition of a septicæmia was "a condition in which there was a local focus of infection from which bacteria were being thrown into the blood-stream continuously or discontinuously." He considered that this was the true bacteriological concept of a septicæmia. Whether pyæmic abscesses occurred or not depended on various factors which were secondary, the essential being that bacteria were being thrown into the blood-stream. Pyæmia, therefore, was a septicæmia plus some secondary factors. He disagreed entirely with the view that pyæmic cases seldom terminated fatally, and quoted in support of his view Whitridge Williams:¹ "It is difficult to give exact figures of the incidence of chronic pyæmia, but it is safe to say that its lesions can be demonstrated in at least one-third of all autopsies upon women dying from puerperal infection." The same author, speaking of cases in which there are septic thrombosed veins which are a common cause of pyæmia (excluding phlegmasia alba dolens) says: "Less than one-third of my patients recovered under expectant treatment." Other figures vary from 100 per cent. mortality (Sippel) to 50 per cent. (Opitz). In cases, however, where primary abscess formation occurred—i.e., abscess formation which was in direct connexion with the primary focus—Dr. Western considered that the prognosis was usually good. These cases he did not include as septicæmias unless the blood culture was positive. He agreed that the success of vaccine treatment was most marked amongst those cases which did not run a course so rapid that death occurred within a week or ten days of labour. Such cases were those in which the balance between virulence of infection and ability to respond seemed to be entirely upset, and therefore he would expect them to be the last to be cured. He did not see what in Dr. Routh's view constituted a septicæmia if he did not accept a positive blood culture more than ten days after labour. He thought that the view expressed by Dr. Routh, that when bacteria were in the blood-stream the tissues were therefore stimulated to their utmost to form antibodies was quite incorrect and opposed to all clinical and experimental observations. If Dr. Routh's view was correct, why was it that while antisera could with advantage be injected intravenously, vaccines produced a far better immunizing response when injected into the tissues. He considered that the uterus in normal apyrexial cases was sterile during the puerperium, and that the divergence of opinion as to this was due not to any difference in the date after labour on which cultures were taken, but rather to difference in the methods employed. Many workers had employed the method described by Döderlein twenty-five years ago,² or some modification of it which included no adequate precautions

¹ *Amer. Journ. of Obstet.*, New York, 1909, lix, p. 758.

² *Archiv. f. Gyn.*, Berlin, 1887, xxxi, p. 430.

to prevent contaminations from the cervix. Personally, he had examined apyrexial cases during the puerperium at periods varying from three days to three weeks after parturition, and had invariably found the uterus sterile. He had not yet isolated a single strain of streptococcus from the uterus which did not hamolyse red blood cells. He could not agree that any special diagnostic or prognostic significance could be attached to the method of taking blood cultures from two different parts of the body at the same time instead of inoculating a similar number of tubes with the same amount of blood from one site. Considering the rapidity with which the blood went completely round the body, and assuming bacteria to be so few that only a portion of the tubes inoculated showed growth, it would appear to be purely a matter of chance whether a bacterium was drawn into the syringe from the arm or from the leg. He pointed out that the cases recorded had been treated in the routine work of a hospital department rather than as a special research, and therefore such points as differentiation of streptococci by fermentation reactions, red and white blood cell counts, &c., had not been done. The dosage of vaccines which had been employed varied in the acute stage from about 5 to 25 million. When the more chronic stages were reached larger doses might sometimes be used with advantage. Generally speaking, the dose of a "stock" vaccine should be larger than that of an autogenous vaccine. He would not go so far as Dr. Williamson, in saying that the use of a stock vaccine was "utterly irrational," nor did he think many authorities placed such great reliance on differentiation tests for streptococci. Both Dr. Williamson and Dr. Topley had taken exception to the practice of using a vaccine as soon as it was prepared. It appeared to Dr. Western that they did not appreciate the facts of the case. Firstly, the thermal death-points of the various pathogenic bacteria had been very thoroughly worked out and were known to be practically constant. Secondly, if an emulsion of bacteria had been heated for an hour to a point known to be above its thermal death-point, if any bacteria remained alive they might have been so much damaged that on sub-culture they showed no growth for two or even three days, but gave a positive result on the fourth day. If, therefore, Dr. Williamson and Dr. Topley were to be consistent they could not have a vaccine ready for use in forty-eight hours, but must wait four or five days. The risk, which Dr. Topley suggested, of introducing *virulent* bacteria did not exist, as bacteria which had been heated for a considerable time to a point above their thermal death-point and suspended in a solution of an antiseptic could not be still called *virulent*; nor was it possible that such bacteria were capable of multiplication as he suggested. However, he considered that criticism on this point could not be of any value unless the method of sterilization employed was known to the critics. Dr. Western had tested all the vaccines used in this series, and also in many other cases of septicæmia, and had not yet found his methods of sterilization to fail. The use of antistreptococcus serum, he said, was based on the supposition that it contained *antibacterial* substances. No one claimed any *antitoxic* properties for these sera. The claim to antibacterial power was not usually supported by scientific evidence.

Obstetrical and Gynaecological Section.

March 7, 1912.

Dr. AMAND ROUTH, President of the Section, in the Chair.

Sacral Teratoma removed from an Infant Two Days Old.

By H. A. LEDIARD, M.D.

At the date of operation the infant was 2 days old and 4 lb. in weight. It was a poorly nourished specimen as well as small, but it was a mature female. The swelling had a blue-red colour, a hard, but well-defined, pedicle, and the contents of the skin sac were felt to be fluid and solid, the latter being irregular and knotty, but not firm. The pedicle at one edge ran close up to the anus, and the other margin extended over the coccyx, and reached the lower half of the sacrum. Distension of the tumour was not noted when the infant cried. The anus was not concerned. The pedicle, at least 2 in. wide, was clamped with Doyen's intestinal anastomosis forceps, and the tumour cut away. The hard cartilaginous part of the interior of the pedicle was cut away with scissors. The skin was stitched over the stump before removing the clamps, but after removal a few more stitches were inserted through the stump and skin in order to arrest oozing; not more than 1 oz. of blood was lost. The infant recovered.

When 9 months old a photograph was taken of the child, and at this time a slight watery fluid leaked from a minute perforation in the scar. At about 3 years of age the child was of average weight and growth, but a slight leak from the scar remained. When about 8 years old the child was examined, and no trace of mental or physical deficiency was observed. The dropping of serum from the pinhole aperture, which had lasted for seven years, had ceased for twelve months. This dropping had been more noticeable when the child walked about, but the amount

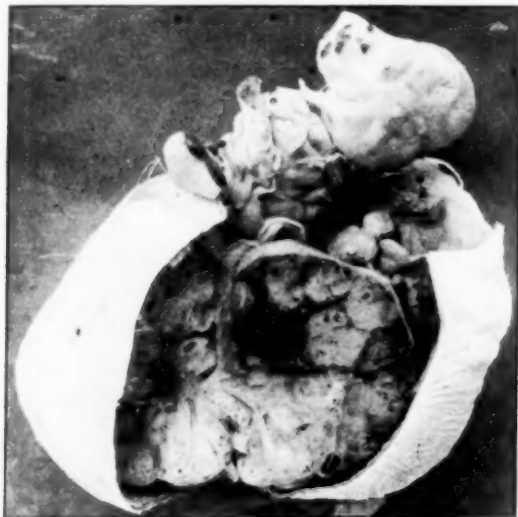


FIG. 1.

Sacral teratoma (front).



FIG. 2.

Sacral teratoma (back).



FIG. 3.

Section showing the various tissue elements of which the growth is composed, especially cartilage and tubes lined with epithelium. ($\times 12$.)

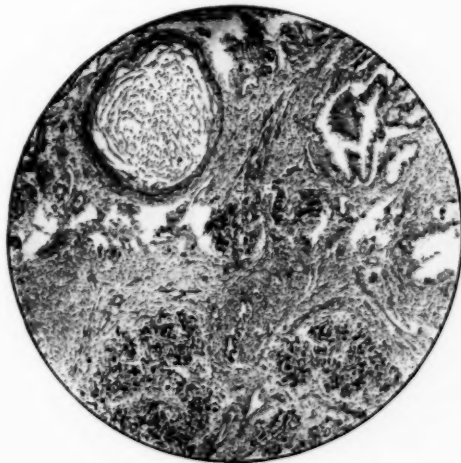


FIG. 4.

Showing some of the spaces lined by high columnar epithelium. Areas of gland structure made up of small acini with cubical epithelium. The large round space is lined by squamous epithelium and filled with desquamated epithelial cells (invaginated)—atheromatous cyst. ($\times 33$.)



FIG. 5.

Showing squamous epithelium covering the growth, but at the right-hand side the epithelium has become modified into the columnar type. ($\times 28$)

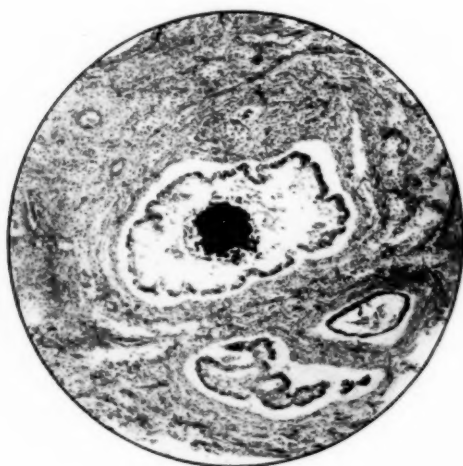


FIG. 6.

Showing cystic space lined by columnar epithelium. ($\times 45$)

was always slight, and sometimes ceased entirely for days together. The site occupied by the teratoma became less elevated and lumpy, and the irregularity of the surface near the buttocks less observable.

The mother had had two children since the birth of the teratomatous infant, neither exhibiting any abnormality.

Structure: Sections show the various tissue elements of which the growth is composed, especially cartilage and tubes lined by epithelium;



FIG. 7.

Showing bone and, at the junction of cartilage, the process of ossification of cartilage matrix. ($\times 33$.)

some of the cystic spaces are lined by columnar epithelium. Squamous epithelium is seen covering the growth, but at one part the epithelium has become modified into columnar type. Some spaces are lined by high columnar epithelium, and there are areas of gland structure made up of small acini with cubical epithelium. A large, round space is lined by squamous epithelium and filled with desquamated epithelial cells (invaginated)—atheromatous cyst. Another part shows bone, and at the junction of cartilage the process of ossification of cartilage matrix.

Large Warty Fibroma of Labium.

By H. A. LEDIARD, M.D.

FROM a woman, aged 33, removed by operation on June 7, 1911; weight $17\frac{1}{2}$ oz. The growth had taken twelve years to reach the dimensions it had, and commenced as a small tumour. The surface



Large warty fibroma of labium.

was warty and corrugated, and the broad pedicle shaded off from thick epidermis into soft mucous membrane. The only trouble caused was due to the weight.

Patient has been married for twelve years and has had six children, four of whom are living. In childhood she suffered severely from inherited syphilis, and bears traces on the nasal bones, destroyed palate (soft), teeth and cornea. Smaller warts were seen, pea-sized, on both labia. Healing was rapid after removal. The patient was seen on February 16, 1912, about eight months after operation, and remains well, and is again pregnant.

Structure of tumour: A section under $\times 20$ diameters shows well-formed fibrous tissue, fairly rich in blood-vessels, covered by a layer of squamous epithelium of normal thickness. The nodular or warty appearance is due to the papillary character of the fibrous tissue, with epithelial covering. The same section, $\times 200$ diameters, shows the well-formed and coarsely arranged fibrous tissue with few nuclei, and several small mononuclear cells in perivascular space.

Fibroid (? Cellular Fibroma ? Sarcoma) of the Uterus.

By HENRY BRIGGS, M.B.

UNDER this threefold heading is produced a submucous cellular growth of the body of the uterus; weight, 2 lb. 6 oz. Encapsulation of the whole growth is absent. The growth is lobulated; the coarse lobulation is on the surface, in the interior of the uterus; here the lobules are approximately 1 in. in diameter. The fine lobulation lies deeply embedded in the posterior wall of the uterus, within $\frac{1}{2}$ in. of the peritoneal coat; here the lobules are like millet-seeds. The lobulation and ramification of the cellular growth are its striking features; its borders bear a less active and less irregular cell distribution than in sarcomatous tumours. The blood-vessels of the growth are not well formed; they are more highly organized than usual in sarcomata. There is not the prevalent breaking down or dissolution of the uterine sarcomatous tumour; the surface lobulation is nowhere devoid of the epithelial covering of the stretched endometrium. Clinically, before operation, it was noted that the tumour was as hard as an ovarian fibroma. Owing to its cellular fibromatous structure, the publication of the report has been delayed for the six months' after-history—a period of time approaching its previous eight months' clinical course.

E. J., aged 30. An attack of rheumatic fever seven years ago. Six years married. Two pregnancies: (1) a child, now aged 5; (2) a miscarriage at six months, two and a half years ago. History of menstrual regularity: Four or five days every twenty-eight days; of continuous uterine hæmorrhage following on shortened menstrual intervals, with the exception of the two regular periods in April and May, 1911; the whole of the menstrual disturbances and the continuous bleeding were limited to eight months. No pain; no pressure symptoms. Physical signs: A large, hard growth equal to the size of a six months' pregnant

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uterus. Treatment: Abdominal subtotal hysterectomy, September 1, 1911. After-history: In good health, March 1, 1912.

Remarks: A "fibroid" of the uterus characterized by a cellular structure is not unknown, a sarcoma is scarcely a justifiable conclusion; on the total available evidence the verdict remains open.

DISCUSSION.

Dr. STEVENS suggested that the growth really was a sarcoma composed of short spindle cells and infiltrating uterine muscle, remains of which could be seen in the strands of fibrous tissue seen in the section. The marked lobulation could be accounted for by protrusion of the growth towards the uterine cavity, the depressions being the result of the compression of the growth by undestroyed uterine tissues.

Dr. HERBERT SPENCER said this lobulated condition had often been met with in cases of so-called "sarcoma." He was inclined to agree with Dr. Briggs that some were simple myomata, although they might closely resemble sarcomata under the microscope. One reason which led him to take this view was that the patients were often young, in Dr. Briggs's case only 30, an age at which undoubted sarcoma of the body of the uterus was rarely met with, the other reason was the remarkable freedom from recurrence which these doubtful "sarcomata" enjoyed, so different from the almost uniform recurrence of true sarcoma.

Large Placenta in Case of Ectopic Gestation Three Months beyond Term.

By HENRY BRIGGS, M.B.

Mrs. R. C., twelve years married; one child, aged 11. History of ectopic gestation: Exactly one year ago, this very week, the last menstrual period occurred, after previous regularity—four days every twenty-eight days. The pregnancy was not considered abnormal until after the movements of the child ceased at the expected full term. Labour did not come on; for six months she had vague pains, in the three months preceding and in the three months following the full term.

On admission: Anæmia, emaciation and fever. The abdomen: The large ectopic gestation sac contained the dead fœtus and placenta; in the right loin the head of the fœtus was recognized; in the pelvis the empty

uterus lay below and to the left. Abdominal section (January 12, 1912): Removal of the fœtus, the turbid, scanty and fœtid liquor amnii, the lower portion of the sac, and the placenta at the site of the right broad ligament, and the small portion (4 in. in diameter) of fœtal sac which was separable from the omentum and the intestines. The abdomen was drained by a glass tube. Recovery was delayed by a sinus, from which necrotic pieces of sac, too adherent for removal, came away after the operation. The sinus closed on February 15, and the patient left the hospital on February 17, 1912.

Remarks: The under-weight of the child, 5 lb. 13 oz.; the over-weight of the placenta, 2 lb. 3½ oz.; the piece of thin-walled sac, 2 oz. The investigation of the placental structures established compression, atrophy and calcification of the villi, and a large addition of blood. The hæmorrhage within the placenta produced its over-weight.

A Fœtus with Congenital Hereditary Graves's Disease.

By CLIFFORD WHITE, M.D.

THE specimen shows the thyroid gland and surrounding parts removed from a fœtus with congenital hereditary Graves's disease. A normal infant's thyroid is shown at the same time for comparison. The mother of the child was a primipara who was admitted in labour to Dr. Spencer's wards at University College Hospital on November 10, 1910. Her history was as follows: She was aged 23 and had been married ten months. The symptoms of Graves's disease were first noticed when she was five months pregnant and rapidly became so marked that in September, 1910, she was admitted under Sir John Rose Bradford with all the classical signs of Graves's disease—exophthalmos, thyroid enlargement, nervousness, tremor and tachycardia. All these symptoms progressively increased as pregnancy advanced. When I saw her, the pulse was 120 and the blood-pressure 142 mm. of mercury. The uterus appeared to be at the full term of pregnancy. The child was lying with the vertex presenting in the right occipito-posterior position. The fœtal heart was uncountable, but was well over 200 per minute, and we discussed whether this was due to the fœtus being affected by the maternal toxæmia or whether the disease was actually present in the fœtus. When labour had lasted eight hours the cervix

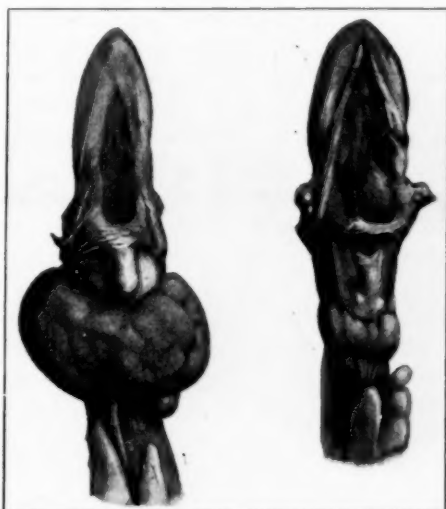
was fully dilated and the head on the perineum, but the child was passing meconium. Its heart was slower than before but was still over 200 per minute. Forceps were applied under chloroform anæsthesia and the child delivered at 11.45 p.m. It was a male child weighing 4 lb. 6 oz. There was no *post-partum* hæmorrhage.

The house surgeon's note made immediately after delivery was: "The child presents all the features of the disease present in the mother. The eyes are prominent and staring, the thyroid shows well-marked uniform enlargement. The heart-beats are uncountable, and a loud systolic murmur is heard all over the præcordium. There is also a fine tremor of the hands. Pupils medium size. Temperature 99° F." The next day the pulse dropped to 150 for a short time, but later rose to 200 again. The child remained very cyanosed. The day after, November 6, the child died, having lived thirty-four hours.

The puerperium was normal; the mother's pulse varied between 120 on the second day after delivery to 100 on the eleventh day. During the puerperium the symptoms of Graves's disease became less and a diminution of $\frac{1}{2}$ in. was noted in the circumference of the neck. The urine was normal. After delivery she did well for some months but became pregnant again in April, and soon afterwards her symptoms became worse. In December, 1911, she was delivered in the Middlesex Hospital of a stillborn premature child that showed no abnormalities. The mother again improved after delivery.

Report of autopsy made on the infant two hours after death: The skin is cyanosed. No rigor mortis present. The eyes are protruding, especially on the right side, so that neither eyelid is quite closed. The pupils are equal and are half dilated. On opening the skull, the caput is large and hæmorrhagic, the dura mater is hyperæmic. There is a large subdural hæmorrhage extending over the right parietal region and going down over the temporo-sphenoidal lobe. The ventricles are healthy. The pituitary is normal. The peritoneum, stomach, intestines, gall-bladder, liver, kidneys, ureters, bladder and pancreas are normal. The suprarenals are rather large considering the weight of the child, but are normal on microscopic examination. The lungs show atelectasis. The heart is normal. Thymus normal. The thyroid, after hardening, measures 3.5 cm. transversely, 2.9 cm. from above down, and 2.1 cm. from before back. An accessory thyroid measuring 8 mm. by 7 mm. by 5 mm. lies on the thyroid cartilage under the root of the tongue. A culture was taken from the thyroid with the usual precautions, but no growth of organisms was obtained.

Microscopical sections of the thyroid show glands lined by high columnar cells. These cells enclose spaces which are devoid of colloid, but which contain mucinous material. The quantity of mucin present varies—some acini are almost filled, others merely contain a small amount adherent to the surrounding cells. There is marked proliferation of the epithelium so that solid columns of cells spread from one acinus to another. In places the proliferation has extended into the lumen of the acini so that the spaces can only be recognized, as such, with difficulty. The cells are for the most part healthy, but in places there



Normal-sized fetal thyroid (on right) compared with fetal exophthalmic goitre (on left).

is definite evidence that the cells are degenerating. There is no lymphoid hyperplasia present.

The child therefore presented all the usual symptoms of Graves's disease, and as regards the pathological condition present the thyroid shows the usual foetal absence of colloid with well-marked epithelial proliferation both intra-alveolar and extra-alveolar. In addition to this there are areas of degeneration present such as are found in some adult cases, and also the increased height of the columnar cells.

I think the clinical and pathological evidence leaves no doubt that this is an example of a child affected *in utero* with exophthalmic goitre

and born of a mother suffering from the same complaint. The only atypical symptom present in the child was the asymmetry of the exophthalmos, but this is explained by the presence of the cerebral hæmorrhage on the right side which was also, no doubt, the cause of death.

The case is of interest from several points of view:—

First, as regards the mother. It again shows how pregnancy acts as a factor in the production of Graves's disease, which progresses until delivery and then improves. Delivery was uneventful and puerperal super-involution, which has been so often described as a complication, did not occur as the patient subsequently became pregnant again.

Secondly, as regards the hereditary nature of the disease. Although not very common, there are many cases on record of Graves's disease affecting mother and child. Mackenzie [2] published a case where eight out of ten sisters were affected and one of these eight had four children who developed the disease.

Thirdly, as regards the existence of the disease at birth. I have been able to find no case like this one recorded in the literature and believe it to be a unique specimen. Ochsner and Thompson's [3] case in a child, aged 5 months, is the youngest case I have heard of. Berry [1] states that the disease is "almost, if not quite, unknown before the age of 2½ years." Steiner [4] thought a case at the age of 5 years worth recording. Although the child did not live long enough for a full observation to be made yet the persistence of the tachycardia throws doubt on Svehla's [5] statement that the foetal thyroid contains no cardio-accelerator substance. Lastly, it is of interest as being one of the very few cases in which it is possible to make the diagnosis of a foetal disease (as opposed to a malformation) before the birth of the child.

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- [4] STEINER. *Arch. f. Kinderheilk.*, Stuttg., 1896, xx, pp. 321-382; xxi, pp. 128-194.
- [5] SVEHLA. *Arch. f. exper. Path. u. Pharm.*, 1900, Leipz., 1900, lxi, pp. 321-42.

DISCUSSION.

Dr. EDEN wished to congratulate Dr. Clifford White upon his excellent description of this rare case. He did not feel quite convinced that it was really a case of congenital Graves's disease, and he would like to point out one or two difficulties he felt in accepting it as such. The first was the existence of the cerebral hæmorrhage. Was it not possible that the cyanosis, and to some extent the rapidity of the heart's action, were due to this cause? Clinically, signs of fetal distress were made out during labour, and this, if the distress were not profound, would account for a rapid heart-rate soon after delivery. It would have strengthened Dr. White's case very much if a photograph showing the exophthalmos could have been presented to the Section. He supposed Dr. White did not attach much importance to the systolic murmur which was said to be present, but it required an unusual degree of auscultatory skill to detect and to time a cardiac murmur when the heart-rate was 200 a minute.

Dr. STEVENS said that the fetal thyroid shown exhibited the structure which was usually seen in the thyroid of an adult suffering from Graves's disease.

Dr. BLACKER did not think that Dr. Eden's objections were of great weight, but no doubt Dr. White would be able to answer them fully. He would like to point out that the sections of the gland much more closely resembled those of exophthalmic goitre than of any other affection of the thyroid. It was difficult to imagine how a cerebral hæmorrhage could account for the rapid pulse and the bilateral exophthalmos, and there seemed no good reason for denying the possibilities of the transmission of such a disease as exophthalmic goitre from the mother to the child when they considered the many other diseases which could be transmitted congenitally.

The PRESIDENT (Dr. Amand Routh) asked for more details as to the progress of the Graves's disease of the mother during the pregnancy. Usually women with Graves's disease did not become pregnant, but if they did, evidences of the disease sometimes diminished during the later months. In this case he understood improvement only occurred after parturition.

Dr. WHITE said, in reply to the President's question, that the patient's symptoms commenced after the beginning of pregnancy and steadily progressed till the sixth month of pregnancy; they then remained almost stationary until delivery, which was followed by rapid improvement. She wrote saying that she remained fairly well for five months till she again became pregnant; a relapse then occurred and the symptoms caused her to seek admission to the medical wards of the Middlesex Hospital. The majority of the recorded cases of Graves's disease showed that little

improvement was to be expected till the last few weeks of pregnancy and, as a rule, not until after delivery. Regarding the points raised by Dr. Eden, the tachycardia was present at the very beginning of labour when there was no reason to suppose a cerebral hæmorrhage had occurred. It was more probable that the hæmorrhage occurred either during the forceps delivery or else at the end of labour when the fœtus suddenly started passing meconium. The note regarding the murmur probably referred to the noise made by the heart-beats running into each other and producing a continuous sound; when over 200 per minute the heart was quite uncountable. In addition to the symptoms, the diagnosis of actual Graves's disease was proved by the pathological findings. The thyroid was regularly enlarged and not cystic. A section was shown with a section of normal fœtal thyroid for comparison and differed from it in the proliferation of the epithelium, the increased height of the epithelium and the presence of slight cell degeneration in patches—all these features were met with in typical sections of an exophthalmic goitre removed from an adult.

Sections of a Three Months' Abortion: Placenta undergoing Advanced Calcareous Degeneration.

By C. HUBERT ROBERTS, M.D.

THIS was of interest in that calcareous degeneration was very rare in such cases. The placenta was removed from a uterus at the Samaritan Hospital from a woman, aged 43, who had aborted eight days before admission. The placenta was very putrid, and had been retained. Great difficulty was experienced in getting it away, and on examination many parts of it were found to be very hard. Sections of the placenta were shown under the epidiascope, and it was very evident that advanced calcareous degeneration existed. So hard were some of these areas that they blunted the knife of the microtome. White infarction of the placenta was very marked, and the syncytial layer was almost absent in most of the villi. There was no history of syphilis. The fœtus had apparently perished at about the second month. Possibly such calcareous degeneration might account for the abortion.

Sections of Ovarian Concretions (Hæmatoliths) and of the Cyst Wall in which they were contained.

By C. HUBERT ROBERTS, M.D.

DR. ROBERTS remarked that cases of "ovarian concretions" had been reported before the Obstetrical Society of London by Hector Mackenzie in 1889 and by Alban Doran in 1898 under the heading of "Blood Concretions in the Ovary." There were specimens now in the Museum of the Royal College of Surgeons.¹ Dr. Roberts's case occurred in a patient, aged 45, from whom he removed a fibroid the size of a foetal head which blocked the pelvis and gave rise to attacks of retention of urine. During the operation the ovaries were seen to be converted into cysts the size of a bantam's egg. These cysts contained dark treacly blood and a large number of blood concretions. Some were the size of a split pea, and seemed to be faceted. Sections of the concretions showed them to be almost crystalline in parts and of a dark yellow colour. Sections of the cyst wall also showed similar bodies close beneath the epithelial lining, but it was not quite certain that the cysts were true lutein cysts. They were certainly not ordinary adenomata of the ovary.

Extraperitoneal Dermoid Cyst (Suppurating).

By H. A. LEDIARD, M.D.

FROM a patient, aged 26, sent to the Cumberland Infirmary on July 22, 1906. Four months previously she noticed a swelling in the lower abdomen which gradually grew larger. Five or six weeks prior to admission, pain in the back began, shooting round into the groins, and a sense of weight in the abdomen accompanied it. The abdominal swelling closely resembled a six months' pregnancy. Firm and elastic and fluctuating, the tumour gave a curious sense of crepitation when moved from side to side.

¹ Doran, "Guide to Gynæcological Specimens, Museum of Royal College of Surgeons, 1912," Nos. 15, 16, 17.

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The abdomen was opened, but the peritoneum not found, but on separating the adhesions between the cyst and the anterior abdominal wall, a silvery-surfaced tumour was exposed, dotted over with large punctiform hæmorrhages. Tapping the cyst caused a jet of pus, thick, greenish, free from odour, containing large masses of curdy material, and amounting to about 2 pints. No organism was seen by the microscope, and an agar tube showed no culture. The cyst was slowly withdrawn. Adhesions were universal, but yielded to the fingers and firm traction. The first ligature was tied just beyond the fimbriated end of the left tube, and the second through the pedicle of the tumour further away. When the cyst was free it was seen that the growth was extraperitoneal, for the intestines were nowhere exposed. The cavity occupied by the cyst was half abdominal and half pelvic. Through the peritoneum the coils of bowel were seen, and in the pelvis there was a plain view down to the rectum and uterus, the latter being felt flattened against the floor of the pelvis; the ureter was not seen or searched for.

The cyst: The cyst had a thick and rather brittle wall, embedded in which were four well-formed teeth, and various kinds of tissue were seen in irregular order. On the inner side of the cyst wall in parts was seen a layer of inflammatory nature. The projecting masses seen were subcutaneous tissue elements covered with squamous epithelium, and contained small nodules of cartilage. Some short hairs were also present.

The wound was drained for twelve days and then healed.

REMARKS.

Ovarian or parovarian cysts formed extraperitoneally are not of every-day occurrence, and no aid to the diagnosis of such is found in books devoted to ovarian tumours, so that when they are met with in the course of an operation a surprise is inevitable. References are made to these growths, for Bland-Sutton,¹ in writing of "mesometric myomata," says: "In some cases these tumours will raise the anterior layer of the meso-metrium, and extend upwards as high as the navel and strip the peritoneum from the anterior abdominal wall. Lawson Tait² seems to have met with only two extraperitoneal cysts, but since

¹ "Diseases of the Ovarian and Fallopian Tubes," 1896, p. 349.

² "The Pathology and Treatment of Diseases of the Ovaries," 4th ed., 1883, p. 185.

he wrote twenty-eight years have elapsed, and exceptional as they are, these cysts have probably been met with by all surgeons who do much pelvic or abdominal work. For example, Dr. W. H. B. Brook¹ has recorded an ovarian cyst which made its way between the layers of the meso-sigmoid and broad ligament. Mr. W. A. Meredith² published an instance of extraperitoneal ovariectomy, which he believed to be unique; and Mr. E. Stanmore Bishop³ recorded a large subperitoneal multilocular cyst, which he described as an unusual condition in ovarian as compared with parovarian cysts. In remarking on Dr. Brook's case at the Obstetrical Society, Dr. Lewers⁴ stated that he had seen a considerable number of cases of ovarian tumour burrowing between the layers of the broad ligament and raising the pelvic peritoneum and peritoneum of the adjacent iliac fossa in an upward direction, carrying the sigmoid flexure upwards as high as the umbilicus.

I have not seen any notice of an extraperitoneal dermoid ovarian which had suppurated, but it is unlikely that the case now recorded is unique. An extraperitoneal cyst will probably give some trouble at all times in its removal, but with a suppurating cyst the conditions might be still less favourable, and I was fortunate in getting away the tumour entire, for in all cases of abnormally dissecting tumours, the chief risk would arise from adhesions too dense to separate from surrounding structures, such as ureter, bladder, uterus or rectum.

Postscript.—Writing on February 16, 1912, the patient reports herself as well, and working as an assistant in a post office in one of the large cities in the Midlands. It is invariably interesting to know how patients fare after any operation of importance, but unfortunately many are untraceable.

DISCUSSION.

Dr. ROBERTS asked if it was certain that the fluid contained in the cyst was pus, if it had been examined microscopically or cultivations taken, as suppuration in ovarian dermoids was very rare, and it might be possible to mistake the yellow sebaceous contents of an ordinary dermoid for pus unless care was taken to show that it was really so.

¹ *Trans. Obstet. Soc. Lond.* (1903), 1904, xlv, p. 415.

² *Lancet*, 1890, ii, p. 297.

³ *Trans. of the North of England Obstet. and Gyn. Soc.*, December 20, 1901.

⁴ *Trans. Obstet. Soc. Lond.* (1903), 1904, xlv, p. 417.

The PRESIDENT (Dr. Amand Routh) asked if it was not possible that the dermoid was between the layers of the broad ligament and of ovarian origin.

Dr. LEDIARD, in reply, said that the cyst contained pus and not the material usually found in dermoids, as the cyst had suppurated. The origin of the cyst was in the left ovary, the ligature having been tied just beyond the fimbriated end of the left Fallopian tube. The uterus was flattened against the floor of the pelvis by the cyst, and the cyst had raised the peritoneum, and so became extraperitoneal or retroperitoneal.

Cæsarean Section for Dystocia due to Coils of the Cord around the Fœtus.

By HENRY BRIGGS, M.B.

A SHORT umbilical cord—whether absolutely short or relatively short by its own coils around the fœtus—may become taut enough during labour to arrest the descent and prevent the engagement of the head in the pelvic brim. On the part of the cord, such an extreme and an unyielding interference, at an early stage, with the mechanism of labour is a very rare occurrence.

In the following recent example of a relatively short cord, the treatment of the dystocia by Cæsarean section, exposed the extent and security of the coiling of the cord, and the degree of its tension, in a manner otherwise clinically unattainable. There were three complete, collar-like and appreciably tight coils round the neck; from the navel to the neck the cord passed under the right shoulder and across the back of the chest and over the left shoulder; the remaining portion of the cord from the neck to the placenta was very short.

Other effects of the stable cord coiling, of the persistent placental adherence, and of the excessive uterine retraction were experienced: (1) Prior to the Cæsarean section, the fœtal back became impalpable through the layer of flatulently distended intestines which filled in the space between the abdominal wall and the retracted uterus below the umbilical level. (2) At this site, during the Cæsarean section the unopened and deeply placed uterus proved too rigid and inflexible for peritoneal approximation; the intervening intestines, partly covered by omentum,

had to be pushed aside by gauze packs whilst the uterine incision was made in the centre of a furrow $1\frac{1}{4}$ in. deep.

The placenta was implanted on the anterior and right wall of the uterus; a large area of the placenta and its short portion of intact cord were withdrawn from the uterus during the extraction of the child by the breech.

The pallor of the child was at first alarming; the coils of the cord were quickly loosened; the child breathed, and is now thriving.

In all other respects the steps of the Cæsarean section were of the usual character.

Inquiries arise as to (1) the diagnosis, (2) the symptoms and the physical signs of the first stage, and (3) the clinical evidence on which the choice of the treatment was founded.

(1) There will be no attempt to declare the steps of a difficult, if not an impossible, diagnosis of the exact nature of the obstruction.

(2) The symptoms and the physical signs were recorded, and the management of the first stage of labour, long delayed and lasting fifty-three hours, was conducted by the obstetric assistant (Dr. Levin), the two clinical clerks, the matron and the ward sister of the Maternity Hospital.

(3) My own disinclination to interfere between my first visit at the forty-third, and my third visit at the completion of the fifty-second hour rested on the patient's previous obstetrical history: the favourable general condition; the two obstetrical factors—the passages and the fœtus—consistent with the birth of the living child when the cervix was fully dilated and the head engaged.

A possible forceps operation was contemplated up to the fifty-second hour—i.e., until the patient had been anæsthetized and the fœtal head palpated by the hand introduced *per vaginam*. Then the sagittal suture lay nearer the pubes (Litzmann's obliquity—an expression of the direction of the taut cord); the disengaged head receded readily above the brim, as if its ascent were easier than its descent; the manipulation of the head elicited the sensation of its being held from above; the head persisted in lying transversely, awkwardly placed, high up, and inaccessible. A forceps operation was objectionable. There had not been any uterine hæmorrhage from separation of the placenta nor any local tenderness of the uterus. The fœtal heart was beating normally. The obstruction within the uterus was beyond any safe method of attack from below; gentle internal handling was limited to the fœtal cranium above the ears. The expulsive labour pains had been repeatedly relieved

by sedatives. Patience in awaiting the natural efforts had been adequate if not excessive. Radical relief was due or overdue; preparations were made, and the Cæsarean section was commenced at the fifty-third hour of the labour.

History of the labour: J. S., aged 22, a carter's sturdy wife, at the full term of her third pregnancy, dating from April 21, 1911, was admitted into the Liverpool Maternity Hospital, in labour, at 10.30 a.m. on January 28, 1912. She was then examined by the ward sister; the foetal head lay transversely above the brim with the occiput to the right; one finger's dilatation of the cervix had been attained in the ten and a half hours since the onset of the labour pains; the pains were slight. She spent the first day in hospital with little complaint. On the following day, January 29, the membranes ruptured prematurely and spontaneously at 2 a.m. (twenty-sixth hour); at mid-day Dr. Levin, the obstetric assistant, reported a half-dilated cervix; at 5.30 p.m. an injection of scopolamine and morphia subdued the almost violent expulsive pains; at 7 p.m. Dr. Briggs first examined her; at 9 p.m. a $\frac{1}{4}$ gr. of morphia was injected; at 11 p.m. the cervix was still incompletely dilated, and the head was still above the brim. On January 30, at 4 a.m., there was complete dilatation of the cervix: a general anaesthetic was given for the physical examination, the result of which has already been included in this report. On February 15, in good health, she left for her home with the growing infant she had nursed throughout her stay in hospital.

Previous obstetrical history: Two previous labours; both at the full term and both normal; the first at the patient's own home; the second, in hospital, lasted only twelve hours; April 6, 1910. The child weighed 7 lb. 11 oz.

REMARKS.

A solitary clinical report of a Cæsarean section and its revelations in a case of coiled cord of a rare and extreme stability suggests further inquiry into the methods of diagnosis, on which accurate authority has yet to be stamped.

Are inferences such as could be drawn from the case now reported sufficiently reliable, or in what direction is greater precision possibly obtainable?

Normal foetal heart sounds throughout the fifty-three hours of labour were not inconsistent with a stable coiling of the cord.

Delivery by version or forceps would have been difficult, if not impracticable, with safety to the mother.

The life of the child rested upon the Cæsarean section.

DISCUSSION.

Sir FRANCIS CHAMPNEYS asked Dr. Briggs whether he was unable to reach the child's neck, by inserting his hand, and whether, had he done so, he might have untwisted the fœtus. [Dr. BRIGGS replied that he was afraid of injuring the lower uterine segment, and that the fœtus could not have been untwisted.] On hearing this the speaker said that he thought that, under the circumstances the best course had been adopted. The case was, as far as he knew, unique, and was extremely interesting.

The PRESIDENT (Dr. Amand Routh) thought that even if Dr. Briggs had been able to get his hand beyond the foetal head and had diagnosed the loops of cord round the neck which were preventing delivery, he would have still performed Cæsarean section as the most hopeful method of saving both mother and child. He did not know of any similar case thus treated, but obviously cases of dystocia due to foetal causes would be more frequently treated by Cæsarean section now that the mortality in aseptic cases was as low as 2 or 3 per cent.

Dr. BRIGGS, in reply, remarked on the risk he feared at the time of intra-uterine manipulations at a level higher than the ears at the fifty-second hour of labour amidst the extreme retraction of the uterus.

A Plea for the Use of a Pathological Classification of the Diseases of Women.

By W. E. FOTHERGILL, M.D.

IN another communication the writer has examined, from the historical point of view, the methods of arrangement used by those who have written systematic descriptions of the diseases of women. The result is briefly as follows. No scientific classification was attempted until about forty years ago, and many recent works are singularly free from any definite arrangement. But since 1870 most writers have used anatomical main divisions named "Diseases of the Vulva," "Diseases of the Vagina," and so forth. In 1893, David Berry Hart¹ recommended

¹ *Trans. Edinb. Obstet. Soc.*, 1893-94, xix, pp. 82-94.

the use of a pathological classification in a paper read before the Edinburgh Obstetrical Society; but the only authors who have followed his lead in this country appear to be J. W. Ballantyne,¹ W. Blair Bell,² and the present writer.³

The object of this short paper is to indicate, once more, the disadvantages of a classification whose main divisions are anatomical, and the need for some new arrangement whose main groups of diseases are based upon their pathological resemblances and differences. It is only fair to the anatomical plan to admit that it is often badly and illogically applied. Thus symptoms are often described as diseases of one organ or another, and real morbid conditions are often placed under the wrong heading. "Cystocele" and "rectocele," for example, are often called "diseases of the vagina," while "prolapse" and "retroversion" are constantly misplaced amongst "diseases of the uterus." If the anatomical arrangement were logically followed, all four should be called "abnormalities of the pelvic connective tissue." Inaccuracies of this kind are avoidable. But even the most careful application of the anatomical division must split up and multiply diseases. Consider a small subject like primary genital tuberculosis. The student finds stray paragraphs about it scattered through his text-book from beginning to end. Suppose he wishes to read about gonorrhœal infection. He finds scraps on the subject in every division of the book; but nowhere is there a coherent account of the effects of this infection upon the genital tract. Take the subject of septic infection. It is described under vulvitis, vaginitis, cervicitis, metritis, para-metritis, perimetritis, salpingitis, and ovaritis. These, however, are not diseases but local pathological processes which occur as incidents in the course of one condition. In spite of this each of them is made into a separate disease and described with symptoms, signs, diagnosis and treatment all complete. The result is that the student forms the idea that there is a disease called "ovaritis," goes on diagnosing it all his life, and is wrong every time. And the same happens with the other words of the same kind.

It is reasons like this which account for the conspicuous failure of most students to acquire, before leaving their schools, any useful knowledge of the diseases of women. They are badly taught, and this is entirely due to the use of the anatomical arrangement.

¹ "Essentials of Gynæcology," 1905.

² "Principles of Gynæcology," 1910.

³ "Manual of Diseases of Women," 1910.

But, apart from these special defects, is it not allowed that the main divisions in any scientific classification should be based upon the most important resemblances between the things to be classified? The most important feature of a disease is the way in which it departs from health, its pathology in short. The word "cancer" brings to mind numerous resemblances between all cases of cancer. The word "infective" conveys quantities of information about all cases of infective origin. But the term "disease of the uterus" calls to mind no resemblance between diseases of the uterus except that of site. The important feature of a disease is not its symptoms or its signs, its cause or its treatment, but its nature or kind. When the student decides that a gynæcological trouble is a disease, say, of the vagina, he is generally wrong, and if he is right he is no wiser—no nearer a complete diagnosis. But when he discovers that a condition is a result of infection, a result of injury or a new growth, much valuable information about the case is gained.

The writer has for some years been using a division into six main groups both for clinical teaching and in systematic work. These groups were suggested by the arrangement introduced into the Pathological Museum of the University of Manchester by Professor J. Lorrain Smith, and they thus have the sanction of professional pathologists. They are as follows:—

- (1) Developmental errors: (a) Congenital; (b) at puberty.
- (2) Vascular changes.
- (3) Mechanical lesions.
- (4) Results of infection.
- (5) Progressive conditions: Overgrowths, new growths, cysts.
- (6) Retrogressive conditions.

(1) *Developmental Errors*.—This must, for gynæcological purposes, contain two subdivisions: (a) congenital errors, and (b) errors of development at puberty. For it is necessary to distinguish between those anomalies which begin during embryonic and foetal life from those which arise during the years just before and after the onset of ovulation and menstruation. A child may be normal, but, through failure to develop at puberty, she may have infantile reproductive organs as a woman; or, through overgrowth of her cervix at that time, she may have a hypertrophied cervix for the rest of her life. Menorrhagia at puberty, again, is a developmental error.

(2) *Vascular Changes*.—Active and passive hyperæmia, which at first produce merely symptoms, finally lead to overgrowth and fibrosis.

Local varicosities occur within the pelvis, and hæmorrhage takes place into the organs, the connective tissue and the peritoneal cavity.

(3) *Mechanical Lesions*.—This is a large and obvious group.

(4) *Results of Infection*.—This group should be subdivided, so far as possible, according to the causal organisms and not into anatomical subgroups. It may include cases of parasitic disease.

(5) *Progressive Conditions*.—These are overgrowths, cysts, and new growths. They are placed in one group because it is difficult to draw hard and fast lines between them.

(6) *Retrogressive Conditions*.—Disorders of the menopause and senile changes form the bulk of this group; but there are also anomalies in the retrogressive changes which are characteristic of menstruation, ovulation and involution.

An arrangement with main divisions such as these has many advantages in teaching. It is logical and complete, there is no cross-classification and the groups are mutually exclusive. They are already familiar to the student through his pathological work, and they are few enough to be easily remembered. They do not include gynæcological symptoms due to general diseases such as anæmia, phthisis and myxœdema, and this is very valuable, because it makes clear the difference between general conditions with pelvic symptoms and primary diseases of women. Nor do these divisions embrace lesions of the rectum and bladder, or diseases of the nervous system. If the gynæcological author wishes to describe diseases other than those of the reproductive organs, he should put them in an appendix and not mix them up with diseases peculiar to women.

The writer does not ask anyone to adopt his own six divisions. They are advanced as a suggestion and to invite criticism; and he will be the first to adopt any improvement. The subdivision may be worked out in various ways. Those who have written books can hardly be expected to rewrite them, though pathological main divisions save a great deal of space. Courses of systematic lectures, however, could easily be reconstructed. Students who really know anything about the subject need not fear to meet the examiner, even though they have not been trained in the use of the anatomical arrangement. In short, the writer hopes that before long everyone will think of gynæcological ailments not in anatomical, but in pathological groups.

DISCUSSION.

Sir FRANCIS CHAMPNEYS said that Dr. Fothergill's paper was very suggestive. A lecturer on obstetrical and gynæcological pathology might profitably make his classification pathological; but for clinical purposes he thought such a classification was impracticable. One had to consider the needs of a practitioner face to face with an affection of a particular region about which he required information, and he thought that for such practical purposes it was impossible to eliminate an anatomical classification.

Dr. ARTHUR GILES said that he had long felt that some revision was desirable in the matter of the arrangement of subjects in gynæcological text-books, and he thought that Dr. Fothergill's suggestions were on the right lines. Certain subjects particularly were suitable for the pathological classification, such as malformations, inflammatory conditions and displacements of the pelvic organs, because in these conditions the affection of a particular organ was not a separate entity or disease but was associated with the pathological process in other organs. Some time ago in the book on "Diseases of Women" written by Mr. Bland-Sutton and himself he had treated the subject of malformations on these lines, grouping all malformations together instead of describing them under the separate headings of individual organs. Other subjects could still be dealt with, perhaps with profit, on anatomical lines; for example, tumours of some of the pelvic organs might in many cases be regarded as pathological entities independent of tumours in the other organs. With regard to the question of the bearing of either classification on diagnosis he thought there was little advantage between the two; even with the anatomical classification, if a student wished to assist his diagnosis by referring to a text-book, it was necessary to go to a certain length in diagnosis in order that he might decide which organ to look up. For diagnosis it was necessary to go further back still, to the consideration of the purely clinical features of the case. He had developed this aspect of the matter in his book on "Gynæcological Diagnosis." He thought they were greatly indebted to Dr. Fothergill for raising the question.

The PRESIDENT (Dr. Amand Routh) thought Dr. Fothergill's paper most useful and suggestive and quite capable of being carried out as regards such subjects as tuberculosis, malignant disease and infections, such as gonorrhœa, but it would be necessary to subdivide each heading into anatomical sections. It was also easy to discuss menstruation and ovulation under the head of physiology and pathology, but such a work would not be as useful to the practitioner seeking a diagnosis for a tumour of a definite anatomical structure, such as the vulva.

Dr. BRIGGS welcomed Dr. Fothergill's efforts to amend the classification. Dr. Briggs held that the anatomical basis did not discourage general pathology and was, to the student and teacher, indispensable.

Dr. BLACKER thought that the matter must be regarded not only from the point of view of the teacher and writer, but also from that of the student. It was very difficult to get students to understand even the simplest classification. He thought that that suggested by Dr. Fothergill, while very convenient and useful in teaching the principles of general pathology was not so suitable in considering the various diseases of the pelvic organs. As could be seen from the author's text-book of "Gynæcology," this method of classification presented certain difficulties; thus, for example, it entailed placing cases of antelexion under the heading of mechanical conditions and cases of vascular caruncle under that of regressive conditions, a mode of classification which was certainly not in all respects correct.

Obstetrical and Gynaecological Section.

April 11, 1912.

Dr. AMAND ROUTH, President of the Section, in the Chair.

Uterus and Appendages from a Case of Primary Amenorrhœa.

By T. W. EDEN, M.D.

M. M., a SINGLE woman, aged 21, was admitted to the Chelsea Hospital for Women on May 5, 1906; she had never menstruated, and she complained, in addition, of pain in the left side and a white discharge. Since the age of 18 she had suffered from attacks of headache, dizziness, and faintness, which recurred every four or six weeks with more or less regularity. During these attacks there was a good deal of leucorrhœal discharge, and she stated that the left breast became swollen and painful, and the left side of the lower abdomen became hard and swollen. On examination under anæsthesia the uterus was found to be small and the sound passed for $1\frac{1}{2}$ in. only. The position and mobility of the uterus were normal; both ovaries were present and appeared to be normal also. No enlargement or thickening of the tubes was detected. The case was regarded as one of infantile uterus, and nothing further was done.

She was readmitted to the hospital on February 13, 1912, nearly six years later, she being then aged 27. Still no menstrual period had been seen; the attacks of pain had recurred more or less regularly, and had now become much more severe; they lasted four days, and for the first two days she usually had to stay in bed. The pain was now almost entirely referred to the left side of the lower abdomen, and during the attack the whole abdomen became swollen and tender. During the last year the severity of the attacks had been steadily increasing. There was continuous white discharge, which became more abundant during

the attacks. On one or two occasions the discharge had been slightly pink in colour. The patient's general health was fairly good, and no signs of disease were detected on examination of the lungs, the heart, or the urine.

On bimanual examination the uterus was found in the normal position, and some ill-defined thickening was felt in the position of the uterine appendages, but the tube and ovary were not definitely felt on either side. It was decided to do an exploratory abdominal operation in the hope of being able to relieve the attacks of pain.

On opening the peritoneal cavity no intestinal or omental adhesions were found, and the vermiform appendix was found healthy. The uterine half of the left Fallopian tube was thickened and considerably dilated up to the cornu of the uterus, over which the swelling appeared to extend; the outer half was not much thickened, but the abdominal ostium was sealed. The right tube was sealed, thickened, and moderately dilated throughout its extent. The left ovary was densely adherent to surrounding structures; the right ovary was normal in size and appearance, except for a few superficial adhesions. I decided to remove both the tubes and the left ovary, leaving the uterus and the right ovary which appeared to be normal. The uterine ends of the tubes were freely excised by cutting into the cornu, and in the left uterine wall a cavity was opened from which a considerable quantity of thick yellow pus exuded on pressure; it was therefore decided to remove the uterus as well, and this was done by the supra-vaginal operation, the healthy right ovary being conserved.

The uterus, after removal, measured fully 2 in. in length, and therefore was not much smaller than a normal nulliparous organ when allowance is made for the portio vaginalis which was not removed. The uterine cavity was lined by a thin and apparently normal endometrium. The tubes both contained pus and their walls were much thickened. The pathologist to the hospital, Mr. Glendining, reports that he failed to find tubercle bacilli in the tissues, but that a small number of giant cells and giant cell systems were present. I may add that there was no sign of peritoneal tubercle seen during the operation. We may, however, say that the salpingitis was in all probability tuberculous, although definite proof is lacking. The ovary removed was practically healthy and contained many unripe follicles and corpora albicantia, and one recent corpus luteum.

It is very difficult to understand why this woman had never menstruated. There is definite histological evidence that the process

of ovulation had been proceeding in a normal manner; the uterus, though rather small, showed a lining membrane which possessed well-developed and numerous glands, and was indistinguishable from a normal endometrium. Why, then, did she not menstruate? The only abnormal conditions found were in the Fallopian tubes, which were sealed, and were the seat of chronic suppurative inflammation. It is not unreasonable to suppose that this process may have been in existence for several years, possibly since childhood, but can it have prevented the establishment of the menstrual process?

In this connexion I should like to recall to the Fellows a very interesting case of primary amenorrhœa published in the *British Medical Journal* in October, 1910, by Mr. W. G. Spencer and Mr. Alban Doran.¹ The patient, who was aged 18 and had never menstruated, suffered from periodic attacks of "peritonitis," for the relief of which Mr. Spencer operated. He found that both Fallopian tubes were absent; the uterus was apparently normal, and both ovaries were present and apparently normal. Mr. Spencer laid open the fundus of the uterus, exposing the uterine cavity, and stitched both ovaries over the opening so as to throw them into communication with the interior of the uterus. In reporting the case eighteen months afterwards he stated that the patient had been perfectly well and, as I understand him, had menstruated regularly. The only possible explanation appears to be that the entrance of discharged ova into the uterine cavity was in this case requisite for the establishment of the menstrual function. And in my own case, the primary amenorrhœa, notwithstanding the presence of normal ovaries and normal uterus, might possibly be explained upon the same hypothesis.

DISCUSSION.

Dr. GRIFFITH said there were many points of great interest in this case. The theory that Dr. Eden put forward, following Mr. Spencer's suggestion, that the entry of the ovum into the uterine cavity was necessary for the production of the menstrual flow needed more evidence in its favour. Ovulation, without menstruation, is a common physiological occurrence in various conditions.

Mr. G. W. JOHNSTONE said that, in treating of the subject of amenorrhœa an important variety, to which the speaker had not alluded, should not be lost sight of. An interesting case which came under his observation many years ago was typical of that variety. A young girl, aged about 14, very anæmic and

¹ *Brit. Med. Journ.*, 1910, ii, p. 926.

obviously in very indifferent health, bearing a history of having undergone medicinal treatment for a long time with the view of promoting the menstrual flow. The mother, being advised to have the patient thoroughly examined, consented, with the result that an impervious vagina had to be incised, thereby relieving the patient of a quantity of retained menstrual discharge. Here was presented a case of doubtless regular menstruation for a very considerable, though unknown, period without the flow.

Fibroid Polyp showing (?) Malignant Glandular Invasion.

By R. DRUMMOND MAXWELL, M.D.

THE patient from whom this specimen was removed was a single woman, aged 44, who first came under notice in January, 1912. There was a history of a severe loss of blood one year previously, and for the last year the menstrual loss had been excessive, with a continuous blood-stained discharge since November, 1911. The menstrual discharge was unassociated with pain. There was a history of flatulence and discomfort after meals.

On examination the cervix was found to be normal and the body of the uterus was of normal size and position. In these circumstances exploration of the interior of the uterus was advised. Great difficulty was experienced in introducing a tent four days later, as a preliminary to dilatation with Hegar's bougies next day. On introducing the dilators large crumbling, caseous fragments came away from the canal, leaving little doubt of the malignant nature of the process. These fragments were submitted to microscopic examination and showed proliferating glandular elements embedded in a degenerating stroma (? fibroid). The sections were submitted, at the request of the relatives, to a consultant, who supported the view as to their malignant character.

One week after this exploration, panhysterectomy was carried out; in addition an appendix, fibrosed at its tip and adherent over the pelvic brim to the sheath of the big vessels, was removed. There were no complications during convalescence.

The specimen shows a uterus with a cavity little altered and lined by normal endometrium. Springing from the internal os by a narrow pedicle is seen a small fibroid polyp, the size of a marble, with an irregular friable surface. The polyp has led to dilatation of the cervical canal. Sections taken through the centre of the growth and stained with van Gieson show it to be a true fibromyoma of the uterus.

Scattered through the growth and reaching its centre are numbers of irregular gland tubules of various sizes and shapes; their epithelial lining is not atypical, but uniformly single-layered, but the glands are showing evidence of active proliferation, and numerous fresh buds and diverticula can be seen growing from their periphery and invading the stroma. The tumour was held to be malignant on the following grounds: (1) The characteristic friable, caseous tissue removed at exploration; (2) the invasion of a normal fibroid to its centre by glandular tissue; (3) the evidence of active proliferation of these glandular elements; (4) the age of the patient.

The sections illustrated, in Dr. Maxwell's opinion, an early stage of a malignant adenomatous growth invading a fibroid.

DISCUSSION.

Dr. HERBERT SPENCER said that, judging from the sections he had seen under the microscope, he had no doubt that the polypus was simple and not malignant. The statistics of hysterectomy for cancer would be much improved if such cases were included. These gland-containing fibroid polypi were not at all uncommon; he had removed several of these growths during the last few months. He preferred to call them adeniferous fibroid polypi or "adeniferous myomata," to distinguish them from "adeno-myomata," from which they were distinct. In spite of Mr. Targett's opinion to the contrary, he maintained that the tumour was simple. He had known patients after the simple ablation of such polypi remain well for many years. With regard to Dr. Stevens's remark that these gland-containing simple fibroids were something new and hitherto undescribed, Dr. Spencer wished to say that they had been known to him for about twenty years, that descriptions of specimens under the above names appeared in the new Gynæcological Catalogue of University College Hospital Museum (published last year by Mr. Lawrence and himself), and that the growths were so characteristic in their consistence and uneven surface that often they could be recognized by the naked eye. Within the last few months he had handed two specimens to Dr. Clifford White for examination, with the remark that they were adeniferous fibroid polypi, which the microscope proved to be the case.

Dr. GRIFFITH was of opinion that the presence of glands, such as were exhibited in this specimen, ought not to be considered as necessarily malignant. He had no recollection of seeing a specimen identical with this, but it seemed similar to those cases of proliferation of the glands in the cervix which were sometimes very extensive and not very uncommon.

Dr. STEVENS said that he was not at all certain that the growth was malignant, and commented on Dr. Spencer's suggested name "adeniferous myoma" for such specimens. Dr. Stevens agreed that the growth was not an adeno-myoma in the ordinary sense, nor a simple adenomatous polypus. A polypus composed of glands and muscle tissue without endometrial stroma he thought was not commonly described, and constituted a new tumour, upon which more information was required.

Dr. CLIFFORD WHITE said that he had examined the polypi mentioned by Dr. Spencer. There were three removed within a few weeks about six months ago. The largest was a tumour measuring about $2\frac{1}{2}$ in. by $1\frac{1}{2}$ in. by 1 in. Microscopic sections prepared from each polypus closely resembled those of the growth now shown by Dr. Drummond Maxwell, although the glands were not so numerous as in his specimen. He had been struck by the very large amount of thick mucus which exuded from these polypi during manipulation, and wondered if the necrotic material which Dr. Drummond Maxwell had referred to could have been partly formed by this mucus.

Dr. MAXWELL, in reply, said that he was very much interested in Dr. Herbert Spencer's remarks on this tumour and on the presence of glandular elements occasionally met with in fibroids, but could not agree with him in his clearly expressed view that such changes in fibroids were simple and non-malignant. In the operator's opinion (which he was glad to find was supported by Mr. Targett) he felt that he had been fortunate to discover the condition in a very early stage of malignancy and that the panhysterectomy was amply justified.

REPORT OF PATHOLOGY COMMITTEE.

This growth is a polypus, the stroma of which is composed of fibromuscular tissue. In the latter are seen numerous gland follicles lined by a single layer of columnar epithelium, not surrounded by endometrial stroma nor small-celled infiltration. Many of the follicles show epithelial buds, but there is nothing in these to suggest a malignant character. The Committee regarded the tumour as a fibromyomatous polypus invaded by simple glandular tissue.

Fibro-adenoma of the Ovarian Fimbria, and the Question of the Accessory Ovary.

By BRYDEN GLENDINING, M.S.

In the region of the pelvic pole of the ovary, and connected with the ovarian fimbria, small firm growths are occasionally encountered which are indistinguishable macroscopically from ovarian tissue, and clinically are frequently suggested to be accessory ovaries. In the



FIG. 1.

Illustrating microscopical appearances of Case I.

majority of instances these growths, when examined microscopically, are readily recognized as simple fibromata; the absence of any epithelial structure excludes the presence of ovarian tissue. The following cases, however, in that they are in part covered by a low columnar epithelium not unlike that covering the normal ovary, and further in that this epithelium is found in the growth itself forming small adenomatous or cystic spaces, present greater difficulty in establishing the distinction from ordinary ovarian tissue.

Case I.—The first case is that of a small pedunculated nodule of hard consistency and white colour found in the region of the ovarian

fimbria. Microscopically the surface is seen to be covered by a low columnar epithelium, which at one point is found penetrating into the depths of the tumour. The mass of the nodule itself is composed of a dense, almost anuclear, fibrous tissue. In this dense stroma irregular cystic spaces are seen lined by an epithelium similar to, but more flattened than, the surface covering. These spaces have not the characters of the ovarian follicle, and the connective tissues are denser than, and different in character to, that of the ovary.

Case II shows a white, almost spherical, mass with a broad flattened pedicle springing from the ovarian fimbria. On sectioning, a cyst with clear watery contents is found to occupy about half the tumour.

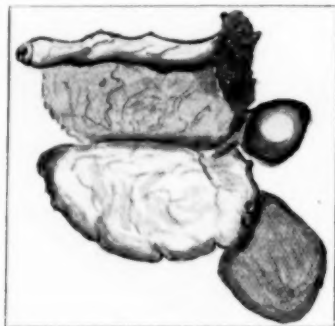


FIG. 2.

Showing small fibro-adenoma of Case II in relation to ovarian fimbria. In relation to the pelvic pole of the ovary is a ruptured follicle distended with blood.

Microscopically a similar epithelium is seen covering the surface and lining numerous small cystic spaces as in the previous specimen. The stroma is less dense but is yet unlike that of the ovary. In this specimen the epithelium of the ovarian fimbria is seen continuous with that over the surface of the growth.

Case III illustrates a small growth situated in the region of the pelvic pole from a case of hydrosalpinx. The surface epithelium and the stroma are similar to the preceding cases. The adenomatous condition is well marked and is characterized by long folded canalicular spaces such as are encountered in the fibro-adenoma mammae.

Case IV represents a small sessile nodule in intimate relation with the ovary at the point of attachment of the ovarian fimbria. The epithelium covering it is distinctly columnar in form and superficially covers small processes which form a coarsely papillary surface. The adenomatous spaces are more dilated and irregular than in the preceding cases. This mass in its continuity with the ovarian tissue is probably to be regarded as of different origin to that of the other cases.

When the literature concerning accessory ovaries is examined, one is struck by the weakness of the evidence upon which the diagnosis of the



FIG. 3.

Illustrating microscopical appearances found in Case III.

ovarian nature rests in the majority of instances. They fall naturally into five groups:—

(1) Cases in which a third tube and ovary have been seen and microscopically recognized. Such a case has been reported by Falk,¹ where a third ovary and tube were found in Douglas's pouch. A second case is quoted by him in which a third ovary was found lying in the front of the uterus.

(2) Cases in which accessory ovarian tissue is surmised to be present

¹ *Berl. klin. Wochenschr.*, 1891, xxviii, pp. 1069-71.

from the fact that after what was thought to be a complete double oöphorectomy had been performed there followed either a pregnancy or recurring menstrual phenomena. When it is recalled how readily a piece of ovarian tissue may be left in the pedicle, it will be conceded that such cases are insufficient in themselves to justify the assumption of the presence of the accessory ovaries.

(3) Cases in which tumours are found having the characters of ovarian growths, while the ovaries are apparently normal. Now as there is no growth which may be said to be diagnostic of ovarian origin, it will be seen that these cases ought really to be excluded.

(4) A group in which small nodules are found in the neighbourhood of the ovary or in the track of its descent and superficially bearing the characters of ovarian tissues, but which had never been submitted to microscopical examination and yet were reported as accessory ovaries. This group comprises a large proportion of the cases recorded, and when it is remembered how frequently small fibromata are encountered in the neighbourhood of the ovary it is at once seen that the likelihood of such cases being examples of accessory ovaries is small.

(5) Cases in which a nodule in relation to the ovary or appendages is discovered where, microscopically, there are small round spaces lined by epithelium and described as follicles, while more typical structures, such as lutein tissue, Graafian follicles and corpora lutea, are absent. The cases reported above probably correspond to this group.

The two recent publications on the subject are those of Mauclair and Eisenberg-Paperin¹ and Meriel,² which are fully reviewed by Doran in the *Journal of Obstetrics and Gynecology* for November, 1911, who rightly points out the slight evidence on which the diagnosis of accessory ovary is often founded.

In conclusion, one suggests that the growths described above are not infrequently mistaken for, and reported as, accessory ovaries, and that they are in reality small fibro-adenomata.

¹ *Arch. Gén. de Chir.*, Par., 1911, v, pp. 755-89.

² *Paris Méd.*, October 14, 1911.

**A Case of Retroversion of the Gravid Uterus complicated by
Over-distension of the Bladder and Hæmaturia.**

By J. BARRIS, F.R.C.S.

I AM indebted to Sir Francis Champneys for permission to record the notes of the following case, which presents some unusual features in its clinical history:—

G. P., a housewife, aged 35, sought advice in the out-patient department of St. Bartholomew's Hospital on January 27, 1912, on account of inability to "hold her water."

Past history: Six previous pregnancies, six children, the last on March 29, 1910. Menstruation was regular and normal; the last regular period ended at the end of September, 1911; since then amenorrhœa.

History of present condition: Amenorrhœa since end of September, 1911; morning sickness began in October, and the breasts enlarged, the patient being pregnant. On January 8 she experienced a severe attack of pain in the lower part of the abdomen, and the following morning was only able to pass urine with difficulty. The amount passed was scanty. A doctor was called in who advised the passage of a catheter, but the patient assured him that she had passed her water. Her doctor was satisfied with this, and the catheter was not passed. For the next seven days the patient continued to suffer from pain in the bladder region, and could only pass urine with difficulty. For the last fortnight previous to being seen at hospital she was unable to hold her water; she had to pass it every hour during the day and about ten times at night. During this time she also noticed that her abdomen increased rapidly in size, and that her legs became swollen.

She then came to hospital and was seen in the out-patient department by Dr. Griffith, who found the abdomen enormously distended. A tumour was outlined, which extended to within an inch of the costal margin. It felt tense and elastic and had the characters of a large ovarian cyst. A catheter was passed and 7 pints of clear urine were withdrawn. The abdominal tumour then disappeared. The patient was then admitted to Martha Ward, and it is noteworthy that three and a half hours after the passage of this large amount of urine a catheter was again passed, when $3\frac{1}{2}$ pints of urine were withdrawn. This urine was examined, and the

following report was made: Specific gravity 1005, faint cloud of albumin, no blood corpuscles, slightly alkaline.

The following note was dictated by Sir Francis Champneys shortly after her admission:—

"Both thighs and legs, especially the left, are œdematous. *Per hypogastrium*: Rising out of the pelvis to 1 in. above the navel is an elastic tumour dull to percussion. *Per vaginam*: The cervix is almost out of reach, high up behind the symphysis, and pointing forwards. The sacral hollow is occupied by an elastic tumour which fills the pelvis." A rubber catheter, size No. 5, was then passed, and 28 oz. of bloody urine were withdrawn, about three minutes being taken for its withdrawal. Bleeding then ceased. The pelvic tumour was now displaced upwards by the fingers, the patient being placed in the lateral position.

Note of bimanual examination after reposition of the tumour: "A mass like the gravid uterus at the third month is felt lying above the brim and extending into the abdomen." A rubber ring of 3 in. diameter was inserted into the vagina.

Pathological report on blood-stained urine: Specific gravity, 1018: reactive alkaline; albumin present, 0.45 Esbach; sugar absent; bile absent; pus absent; urea, 1.7; blood: guiac test positive, red blood corpuscles present; no casts; film and culture showed no micro-organism.

Further history of the case: A rubber catheter was inserted for the next twelve hours after the examination, and during this time no more blood was passed in the urine. The patient was given urotropine, and the catheter was passed regularly every four hours for the next four days, after which date its use was discontinued. The urine on one occasion only contained a few red corpuscles and leucocytes. There was at no time any evidence of cystitis. The patient was discharged on February 5, and when seen nine days ago, on April 2, was still in good health. The ring is no longer worn, the uterus is large enough to remain above the pelvic brim—i.e., a line joining the sacral promontory to the top of the symphysis pubis—and the urine is passed without difficulty, contains no blood corpuscles, and is sterile. The bladder sound now passed 4 in. only.

REMARKS.

(1) Hæmaturia in association with retroversion of the gravid uterus is a well-known complication, but in all the cases which I have been able to find recorded the hæmaturia has been caused by the accompany-

ing cystitis. In this patient, however, there was no evidence of cystitis, for no micro-organisms were found either on staining films or after cultivation. That cystitis did not supervene is somewhat remarkable.

(2) The hæmaturia may have been caused by the rupture of a blood-vessel in the wall of the bladder, or by a tear in the lining mucous membrane owing either to the over-distension of the bladder or to the sudden relief of tension upon the withdrawal of the urine.

Grosse, in a critical review of the causation of hæmaturia during pregnancy¹ states that a tear in a large varicose vein of the bladder is a common cause. He mentions that the bladder has been opened in such cases, and the existence of a torn varicose vein demonstrated. These varicose veins are, in his opinion, due to the pregnancy, just as are hæmorrhoids and varicose veins of the vulva. Luys has examined the mucous membrane of the bladder during the latter months of pregnancy. In all cases so examined he has noted an intense vascularization of the mucous membrane, and some dilated and tortuous veins. These appearances have been specially remarked in the region of the trigone. No cystoscopic examination was made at the time in the case now recorded, as it was feared that the manipulations might cause a recurrence of the bleeding. When the patient was again seen on April 2 the opportunity was taken of examining the bladder mucous membrane by the cystoscope, when a varicosity of the veins could be clearly demonstrated, in the region of the trigone.

DISCUSSION.

The PRESIDENT (Dr. Amand Routh) had seen a somewhat similar case of hæmaturia with retroverted gravid uterus, in which the bladder had been enormously distended for some weeks, but the patient was able, nevertheless, to pass what she considered to be normal quantities of water at normal intervals. This had led to the diagnosis, before admission, of ovarian cyst and gravid retroverted uterus. He thought the hæmaturia in these cases was due to separation of the mucous membrane which does not admit of stretching without laceration like the other coats of the bladder.

Dr. GRIFFITH had seen this patient on her arrival at St. Bartholomew's Hospital. The distension of the bladder was greater than he had ever seen, and reached to the ribs, and in spite of the duration, the temperature was normal, and there was no evidence of cystitis or of hæmaturia. In cases less severe, and of no longer duration, acute septic cystitis was usually present, and in some ended fatally.

¹ *Rev. Mensuelle de Gynéc.,* Par., 1910, v, pp. 143-49.

Mr. G. W. JOHNSTONE said he would like to ask Dr. Barris what style of catheter was used in this case, and referred to a paper by himself on this important subject, in the *Transactions* of the British Gynaecological Society for 1891.¹ One of the cases mentioned in that paper showed that much blood in the urine might be due to injury to the mucous membrane of the urethral canal. He expressed the belief from his experience that the retention of a catheter after the reduction of the retroverted organ was not essential, as the patient would be found to pass urine readily on hands and knees.

Dr. MAXWELL agreed with several other speakers that hæmaturia in these cases bore no necessary relation to infection. In his opinion, apart from infection (hæmorrhagic cystitis), one of the most common causes of severe bleeding into the bladder was due to too rapid catheterization. In these cases of over-distension of the bladder the vesical mucosa must be deprived to a great extent of its blood supply. As a result of rapid emptying of the bladder there was a sudden reflex of blood to the mucosa with hæmorrhage into it from its free surface. He had always expressed the view that such bladders should be emptied with extreme care, using the smallest size catheter possible, and allowing sometimes an hour to an hour and a half for the process. They were not suitable cases for treatment in the receiving room and casualty department of the hospital, but should be admitted to the wards where, as a rule, with regular catheterization every six hours spontaneous correction of the position of the uterus was the rule in twenty-four hours' time.

Dr. HERMAN said he had once been called in consultation to a puerperal woman who suffered from retention of urine. A doctor had passed a catheter without any difficulty, but had not been able to empty the bladder. He (Dr. Herman) cut into the bladder from the vagina, by an incision in the middle line. When this had been done a mass of black clots came tumbling out. The incision was left open, so that the bladder might be drained. There was no further hæmorrhage and no fever. The incision, as usual, contracted to the size of a pinhole, and then was easily closed. The patient remained perfectly well. The cause of the bleeding was never discovered. Dr. Barris's well-reported case was important, in that the varicose vein in the bladder was seen.

Dr. BARRIS, in reply, said that the catheter used was a rubber one; the date of the pregnancy when the symptoms occurred was between the third and fourth month, for the last regular period was stated to have ended at the end of September, and the symptoms began on January 8.

¹ *Brit. Gyn. Journ.*, 1891-2, vii, pp. 334-37.

Death of the Child due to Rupture of Umbilical Vessels during Labour.

By HERBERT WILLIAMSON, F.R.C.S.

DEATH of the child during labour from hæmorrhage caused by rupture of the umbilical vessels is a rare phenomenon. A normally inserted cord may be torn across when a woman is delivered in the upright position, and similar accidents due to absolute or relative shortness, when during delivery the woman was recumbent, have been observed by Westphalen and Meyer. In most instances, however, where a child has bled to death from rupture of an umbilical vessel during labour the insertion of the cord has been velamentous. I propose to record a case of this kind and to offer a few remarks upon the condition.

Many errors of development of the placenta are of embryological rather than of clinical interest, but velamentous insertion of the cord is an exception, for the life of the child is placed in danger. Those who have tabulated series of cases state that the insertion of the cord is velamentous in about 0·7 per cent. of all human placentæ.

Chiari found it in 0·4 per cent. of all placentæ examined.

Lefèvre	..	0·84	..	..	..
Croom	..	0·7	..	..	..
Ahlfeld	..	0·9	..	..	..

In twin pregnancies it is more common. In the Dresden clinic, under von Winckel, it was found in 5 per cent. of twin placentæ, but in only 0·57 per cent. of single placentæ, and the statistics from other clinics confirm this observation. Cases of velamentous insertion of one cord with uni-ovular twins have been recorded by Valenta, Kuhn, Hüter, Winslow, Kiesel, Ruge and Ricker. Thevenot has described a twin placenta in which the insertion of both cords was velamentous.

I do not intend to enter upon the vexed question as to what errors of development give rise to this abnormal condition or as to why it should be particularly common with uni-ovular twins. Hubert Peters has critically examined the various suggestions made, and I refer those interested in the question to his paper. It is sufficient to say that some of the explanations offered are founded upon fundamentally false conceptions of the development of the umbilical cord and that the rest are

mere guesses, not theories built upon solid foundations of observed facts.

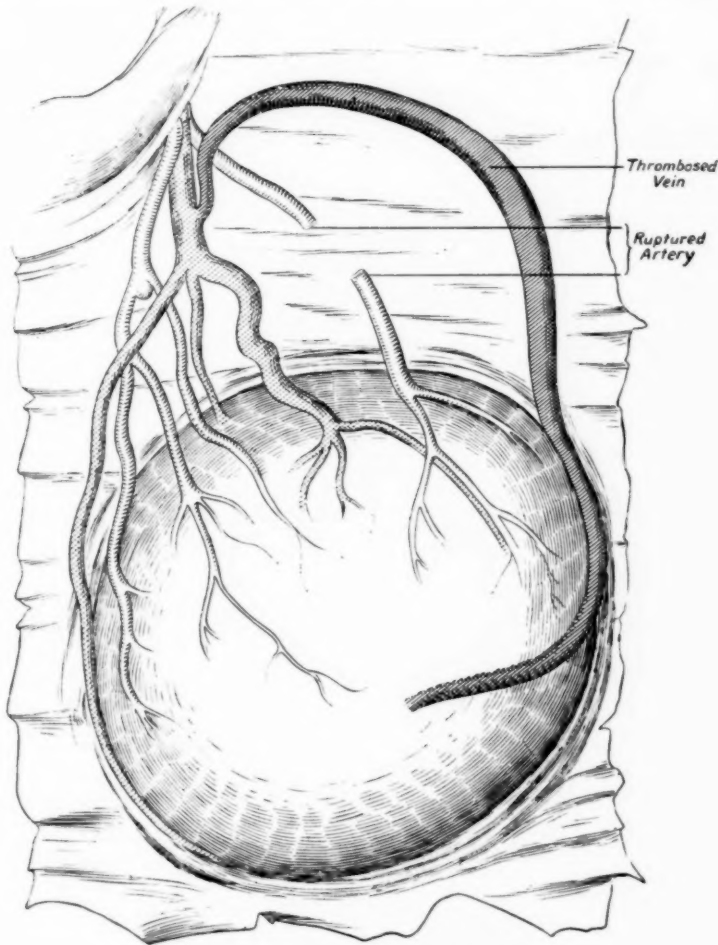
The essential anatomical feature of a velamentous placenta is the termination of the cord at some distance from the placental margin, the vessels diverging from one another and running over the chorion læve for a greater or less distance. They do not necessarily pass to the placenta by the shortest route but sometimes make a wide sweep over the membranes, and may eventually reach the placenta at a point on the margin most distal from the cord. If these vasa aberrantia run in the portion of the membranes which lies in front of the presenting part of the child they are termed "vasa prævia," and it is obvious that they imperil the life of the child in two ways: (1) they may be compressed between the presenting part and the wall of the lower uterine segment and thus cause asphyxia; (2) they may be torn across when the membranes rupture and thus cause hæmorrhage.

The case I am about to record presents two unusual features: (a) the umbilical artery which ruptured was not a vasa prævia, and (b) the branch of the umbilical vein which corresponds to the ruptured artery was thrombosed throughout the greater part of its length.

S. S., aged 32, was admitted into the lying-in ward of St. Bartholomew's Hospital on February 25, 1912. Her one previous pregnancy had terminated in the birth of a still-born child in 1910, at Queen Charlotte's Hospital. The cause of the child's death is not known, but there is no note of any abnormality of the placenta. Her second labour commenced at 6 a.m. on February 25, 1912. I examined her at 3 p.m. on the same day and found a generally contracted pelvis. The measurements were: Interspinous, $9\frac{1}{4}$ in.; intercrystal, $9\frac{1}{2}$ in.; external conjugate, 7 in.; diagonal conjugate, 4 in.; estimated true conjugate, $3\frac{1}{2}$ in. The child was small and lay in the third position of the vertex; the head was above the brim but could easily be made to enter; the cervical canal admitted one finger. Fœtal movements were felt and the fœtal heart was heard. I decided to allow the labour to take its natural course. At 6 a.m. on February 27 the cervix was fully dilated and the head had descended into the pelvis. The patient now began to lose a little blood with each pain, and at 6.10 a.m. the membranes were ruptured artificially. The bleeding still continued, so at 6.30 forceps were applied and the child delivered without difficulty; it was pale and bloodless, and the heart was not beating. Twenty minutes later the placenta was expelled.

The placenta, which I show to-night, is of the velamentous type, the

cord breaking up into its constituents $3\frac{1}{2}$ in. from the placental margin. The first vessel to leave is an umbilical artery which has ruptured 2 in. from the cord. The distal end can be traced in the membranes to the



Rupture of umbilical vessels during labour.

placental margin. Almost at the spot where the artery leaves the cord a large vein enters; this vein measures 15 in. in length and runs across the amniotic sac between the amnion and chorion, then coursing over

the foetal surface of the placenta it dips downwards into the placental substance $2\frac{3}{4}$ in. from the margin. The vessel runs across the membranes at a considerable distance from the placenta and constitutes a true *vas aberrans*; it is thrombosed throughout its length except for the last $\frac{1}{2}$ in. When it reaches the cord it turns on itself and runs downwards towards the placenta for $1\frac{1}{4}$ in. before joining the main vein. The second umbilical artery leaves the cord a short distance below the level of the first and breaks up into its branches 2 in. from the cord. At its first bifurcation is an aneurysmal dilatation.

It is not easy to understand the conditions found, but I suggest the following explanation: The thrombosed vein runs close to the opening in the bag of membranes through which the child was born and evidently must have been a *vasa prævia*. It was probably compressed between the presenting part and the uterine wall at a spot near its entrance into the main umbilical vein, for this is the only place where it contains no thrombus. As the result of the compression to which it was subjected the circulation was arrested, the vein became distended with the blood and the blood coagulated. When the patient passed into the second stage of labour the membranes did not rupture immediately, and as the increasing retraction of the uterus drove the bag of waters on toward the vagina the chorion gave way near the upper pole of the ovum. The amnion remained intact, but in the rupture of the chorion the artery was torn across.

A few days after the delivery of this patient my attention was drawn by Dr. Barris to a specimen of velamentous placenta with rupture of an umbilical vein, which had just been sent to the Museum attendant at St. Bartholomew's Hospital for preservation. Through the kindness of Dr. Drummond Robinson and of Dr. Harris, the Resident Medical Officer at the British Lying-in Hospital, I am able to record the clinical history.

Mrs. H. was admitted into the British Lying-in Hospital under the care of Dr. Drummond Robinson on March 2, 1912. She went into hospital for her delivery because she was anxious to have a living child, and in her one previous labour, which occurred in 1909, craniotomy had been performed on account of contracted pelvis. The pelvic measurements were: Interspinous, $10\frac{1}{2}$ in.; intercrystal, $10\frac{3}{4}$ in.; external conjugate, $7\frac{1}{4}$ in.; diagonal conjugate, 4 in. Labour pains commenced at 10.30 a.m. on March 10, and with the first few pains about an ounce of blood was lost *per vaginam*. At 8.40 p.m. the membranes ruptured

spontaneously; at the time of rupture there was a gush of blood and subsequently a little blood escaped with each pain; in all about 6 oz. were lost. At 10 p.m. the cervix was fully dilated and at 10.20 the child was born. It was white and bloodless, no pulsation was felt in the cord and the heart was not beating. Fifteen minutes later the placenta was expelled.

When the placenta was examined the insertion of the cord was found to be velamentous, the cord terminating 3 in. from the placental margin and a branch of the umbilical vein was torn across at the site of rupture of the membranes. From this vein the child had bled to death.

On referring to the literature of the subject I find that similar cases have been recorded by Peiser, Beuckisser, Ricker, Hüter, Chiari, Valenta, Langerhans, Croom and Hugues. In four of the cases death was due to rupture of a vein and in the remainder to rupture of an artery. Knapp has reported a remarkable case of twins in which both children bled to death from the rupture of a single vessel:—

A primipara, aged 21, went into labour at the end of eight months' gestation. Simultaneously with the rupture of the membranes a considerable quantity of blood escaped and half an hour later she was admitted to the University Clinic at Prague. On admission she was still losing bright red fluid blood. Twin pregnancy was diagnosed: both children presented by the vertex, the head of one occupying the pelvic brim, the head of the other the right iliac fossa. Vaginal examination showed that the cervix was absorbed, the canal admitted one finger, and the placenta could not be felt. On inserting a speculum the blood was seen to come from the interior of the uterus. Fœtal movements were not felt and fœtal heart sounds were not heard. The patient presented no signs or symptoms of hæmorrhage, and the possibility of a velamentous insertion of the cord and the rupture of an umbilical vessel was considered. The vagina was plugged, and an hour later the first child was born naturally. After an interval of ten minutes the membranes of the second child presented; they were ruptured and the child was delivered easily. Both children were blanched and dead. The placenta showed free anastomosis between the vessels of the two cords. The insertion of the cord of the first twin was velamentous, and in the rupture of the membranes a large vessel had been torn across. From the injury to this vessel both children had bled to death.

Diagnosis.—The diagnosis can be made early in labour if pulsating vessels are felt running across the presenting pole of the bag of

membranes. Peters records a case in which he diagnosed the condition in this way, and by rupturing the membranes at a spot where no vessels were felt, and pushing aside the vessels in front of the presenting part, he was able to deliver a living child. After bleeding has commenced the condition has usually been mistaken for placenta prævia or accidental hæmorrhage; in one or two instances, however, suspicion has been aroused because in spite of severe bleeding the mother showed none of the signs or symptoms of hæmorrhage. I suggest the possibility of confirming the diagnosis in such cases by microscopical examination of a film of blood; the demonstration of nucleated red corpuscles would prove that the child was bleeding. Unfortunately, it is only in hospital practice that the appliances for such an examination are likely to be at hand.

Prognosis.—I have already pointed out that the child may die from asphyxia, from hæmorrhage, or from a combination of the two. Peiser's case illustrates this last condition, for at the post-mortem examination of the child the lungs contained a greenish-yellow fluid mixed with blood, and the trachea and bronchi, in addition to this fluid, contained meconium. Peiser concludes: "The cause of death is shown to be intra-uterine breathing of the child and intense anæmia, the result of hæmorrhage from an umbilical artery. Obviously the asphyxia occurred at the beginning of labour through pressure of the head upon the vasa prævia, interfering with the circulation at a time when the amnion was still intact. The death-blow was given by the hæmorrhage which set in through tearing of the umbilical artery when the membranes ruptured." The case recorded to-night is of importance because it shows that if rupture of the membranes be unduly delayed it is possible for the child to bleed to death from tearing of a vessel which is not prævia.

Treatment.—Spiegelberg advises that when the diagnosis is made early, rupture of the membranes should be delayed by every expedient until the cervix is fully dilated, and that the child should then be extracted as rapidly as possible. He remarks, further: "Occasionally it will be possible to prevent injury to the vessels by artificially opening the bag of membranes at the least exposed spot and drawing the vessels to one side; but of course this can only be done if the passages are sufficiently dilated." This procedure was successfully adopted by Peters. It is clear that there is grave risk in following this course, the child may die from asphyxia before the membranes rupture, and after rupture the pressure of the presenting part may so extend the tear that the vessels

are involved. Ricker proposed to pass ligatures round the presenting vessels with an aneurysm needle and to divide them between the two ligatures; the mechanical difficulties of such a procedure are obvious. In discussing his case Peiser says, "Had the woman come under observation when the hæmorrhage commenced and had I been put on the right track by feeling the pulsation of the vessels, I could have administered a cold vaginal douche, for, I take it, stimulation by cold is the chief reason why children so seldom bleed to death in precipitate labour with tearing of the cord." This method of treatment seems to me to have little to commend it. Knapp treated his case by vaginal plugging; but plugging is a two-edged weapon, for if the vagina be packed sufficiently tightly to arrest the bleeding it will also arrest the circulation through the vasa prævia and so asphyxiate the child.

I am forced to the conclusion that when diagnosed early in labour the best chance of saving the life of the child lies in Cæsarean or in vaginal section, but when the vessel has once ruptured the life of the child is so precarious that I do not think it justifiable to subject the mother to the risk of operation.

I am indebted to Mr. G. M. Roberts for the excellent drawing which accompanies this communication.

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DISCUSSION.

Dr. MAXWELL showed, for Dr. Andrews, a specimen similar to that exhibited by Dr. Williamson. A rupture of a vein had occurred about 2 in. from the placental edge. During labour free bleeding had occurred towards the end of the second stage, and suggested the diagnosis of a low insertion of the placenta. The child was fortunately delivered shortly after, for already it was in a condition of severe shock, from which it eventually recovered.

Dr. HEDLEY showed a similar specimen in which the cord had a velamentous attachment, and in which a large placental vein had been ruptured. The two ends of the vein could be seen in the edges of the rent in the membranes; at the time of delivery the placental end was filled with recent clot; the other was empty. The patient's history was as follows: She expected to be confined in the first week of April, and had felt movements on April 4. At 2 a.m. on April 6, without any warning, she suddenly lost about 2 pints of blood or blood-stained fluid. An obstetric clerk was called from St. Thomas's Hospital, who found on arrival that the bleeding had stopped; the woman's pulse-rate was 130 to the minute, the os was about 1 in. in diameter, the head was entering the pelvis, and the edge of the placenta could be felt posteriorly. The patient was admitted to the lying-in ward of the hospital at 2.45 a.m. There was no further bleeding. Labour pains did not come on until 6 in the evening, and delivery took place naturally at 10.30 p.m. The child was slightly macerated, the eyelids and small areas in the groins and on the back having lost their epithelium. The bleeding fourteen hours before the onset of labour pains was presumably due to the position of the placenta, and its sudden appearance to the rupture of the membranes. Dr. Hedley did not think that the rupture of the vein was the cause of the death of the child in this case, as it seemed almost certain from the maceration that death must have occurred about two days before delivery; had the child been alive when the membranes ruptured it was probable that it would have died from hæmorrhage.

The PRESIDENT (Dr. Amand Routh) asked if Dr. Williamson thought it possible that rupture of placental vessels was often a cause of apparent or concealed accidental hæmorrhage.

Obstetrical and Gynaecological Section.

May 2, 1912.

Dr. AMAND ROUTH, President of the Section, in the Chair.

Case of Ganglion Neuroma (partly Embryonic in Structure) of the Mesentery.

By H. MACNAUGHTON-JONES, M.D.

THE patient, aged 18, was first seen by me in consultation with Dr. Beckett-Overy in June, 1911. The following are the few prominent facts that can be gathered from her previous history before she came under Dr. Beckett-Overy's care in April, 1911. When she was aged 5 a swelling was discovered in the abdomen, and this was associated with constipation. Nothing appears to have been done further than the adoption of treatment for the latter. Again, when she was aged 10, advice was taken about the swelling, which had not increased much during the interval. At the age of 12, in the course of a general examination for some chest trouble, the tumour was accidentally discovered, and was at first thought to be a faecal accumulation. Enemata at the time showed that this supposition was incorrect, though that there was ground for the surmise was proved by the removal of an enormous quantity of old faecal and undigested material. After the bowel was emptied, on further examination the lump gave the idea of an extremely hard, almost ossified, fibroma. After consultation it was then thought well to have a tuberculin test. This was done and the result was reported as positive. Shortly after this she was seen by a distinguished physician, who was sceptical as to the presence of any tumour. Also the parents were deterred from

consenting to any operative steps by the very unfavourable opinions they got as to the possibility of an operation. When seen by Dr. Beckett-Overy on April 11, 1911, the mass appeared to be the size of a large orange, situated below the umbilicus at the left side and covered by the rectus muscle. It gave the impression of either a deeply seated omental tumour or a mesenteric glandular mass; but it was difficult to define its exact position, limits, or attachments. The only symptoms were those of constipation and sickness. The latter symptom became more aggravated with the enlargement of the tumour, and continued up to the time of its removal. When I saw her with Dr. Beckett-Overy the above description, as given by him, fairly represents the topographical features of the tumour, which, though movable behind the rectus, appeared to have a deep and firm attachment, while it was impossible to separate it from the overlying rectus.

The tumour had lately increased in size and was now much larger than when first seen by Dr. Beckett-Overy, extending from 1 in. above the umbilical line to some 3 in. below it. The decision arrived at was to keep it under observation, and if further growth occurred to remove it.

When she was again seen by him in December there was a considerable increase in the size of the tumour, and a quite apparent bulging on the left side of the abdomen. It was then decided to operate. Accordingly, on December 30, I operated, Dr. Beckett-Overy and my son assisting, Dr. Herbert Scharlieb giving the anæsthetic—scopolamine and morphia with chloroform. By a double oblique incision, which included a portion of the rectus, the capsule of the tumour was exposed. It was covered by omentum and partly by bowel. There were some adhesions of the omentum and the bowel which were easily separated, but then it was found that the mass was imbedded in the mesentery, between the layers of which it lay. Its firm mesenteric attachment to the left side of the vertebral column was hidden from view and extended for some 9 in., and there was no little anxiety in its separation with the finger and scissors.

In the final delivery of the tumour, at the upper portion of its attachment, there was very severe venous hæmorrhage, the abdomen almost filling with blood. This was completely controlled by clamp and ligature. The rest of the operation was simple. The pelvic cavity was explored, all the organs were normal. After the operation there was great feebleness of pulse, and the temperature was subnormal for

two days. Troublesome vomiting continued for some five days. There was considerable mydriasis, and the pupils reacted badly to light for a fortnight. She was treated by proctoclysis and atropine and strychnine injections, together with nutrient enemata.

She left the Home on January 28. The last I heard of her was on April 8. She was then able to walk two to three miles.

The growth is a very rare one. I do not know that there is any instance of such having been exhibited in this country, not at least in this situation. Neuromas, first described by Virchow, were divided into ganglionic, cellular, or fibrillated. He further divided the ganglionic into medullated and non-medullated. Green, in the last edition, refers to the fact that neuromas are especially apt to be formed in connexion with the sympathetic system and ganglia. This would appear to have been so in this instance. Starr notices their congenital origin, and this, taking the early age at which the growth was first discovered, I think was the origin in this case. A true ganglionic neuroma is different from the false variety, the latter being formed essentially by a development of fibrous tissue within the nerves, whereas the true variety is a neoplasm composed of nervous tissue. The tumour I show is of the true variety.

For the following exhaustive report I am greatly indebted to Dr. Hubert Turnbull, Director of the London Hospital Pathological Institute, as also to Dr. Drummond Maxwell for his kind assistance in having this carried out.

PATHOLOGICAL REPORT BY HUBERT M. TURNBULL, M.D.

Macroscopic Appearances.

A mass about 15 cm. by 11 cm. by 10 cm., partially fixed in formalin. The mass has a smooth surface to which a little fatty tissue is lightly attached in places. The mass has a deep groove, which constricts it near the centre of its long axis, and there are three or four other grooves, so that it has a lobulated appearance. A pedunculated excrescence $3\frac{1}{2}$ cm. by 2 cm. by 1 cm. projects from it. There are also two discrete nodules, the largest measuring 4 cm. by $2\frac{1}{2}$ cm. by 2 cm., which are attached to the capsule, and there is another separate nodule, measuring 2 cm. by $1\frac{1}{2}$ cm. by 0.3 cm., which lies in the areolar tissue outside the capsule (figs. 1 and 2). The mass feels very firm and somewhat elastic.

A section has been made through the long axis (fig. 3). The greater part of the cut surface is slightly sunken, smooth, firm, and elastic. It is, in general, of a yellowish-pink colour, but shows whorls of interlacing, slightly raised cords and threads of paler colour, between which

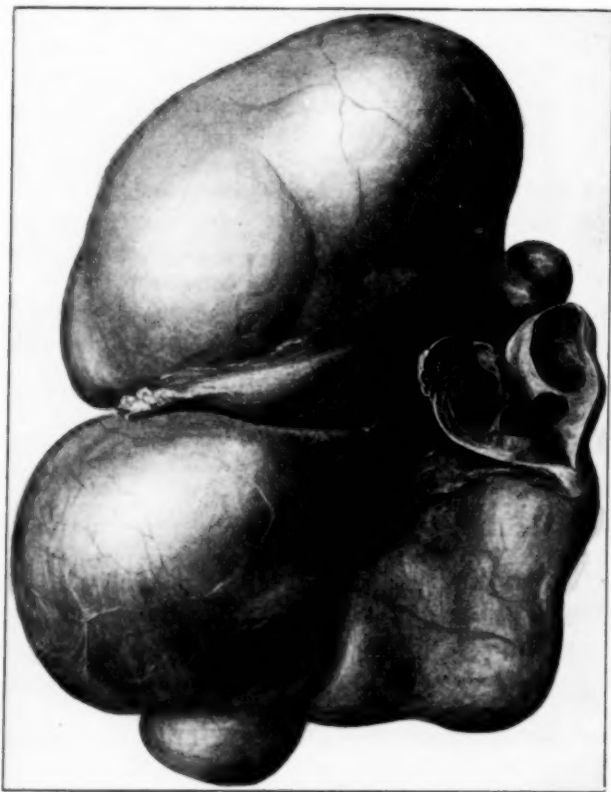


FIG. 1.

This and fig. 2 depict the two surfaces of the tumour and its lobulated character, with the pedunculated excrescence and the nodules referred to in the report. ($\times \frac{3}{4}$.)

are enclosed slightly sunken, somewhat translucent, darker areas. The appearance suggests a section of a firmly rolled ball of twine. The whorls are grouped in two places so as to form rounded lobules, one of which measures 7 cm. and the other 1.8 cm.

Portions of the cut surface have a different appearance. There is (1) an area, 3 cm. by 1 cm., which is occupied by a friable, pink tissue, arranged in a net which encloses numerous ragged spaces. (2) A cavity, 3 cm. in diameter, which is empty and lined by some brownish material.

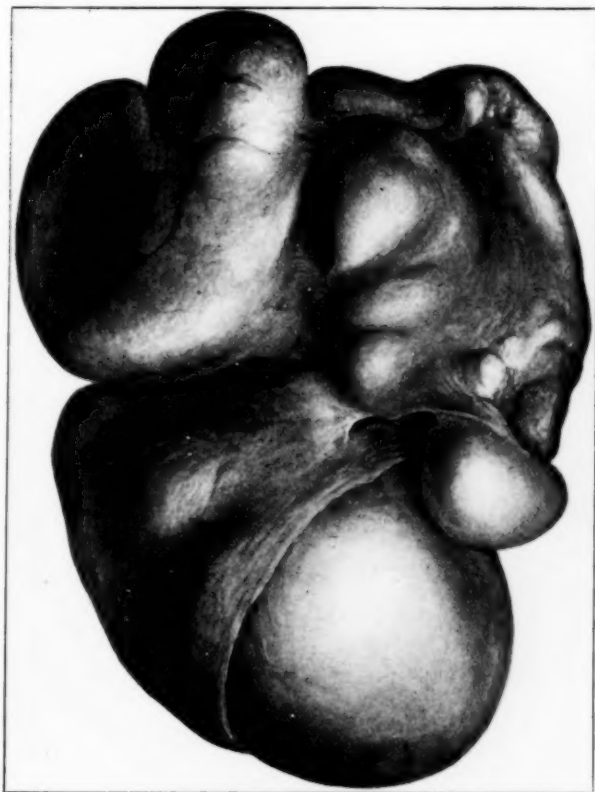


FIG. 2.

(3) A sharply defined cavity, $4\frac{1}{2}$ cm. in diameter, which is filled partly by dark brown jelly and partly by a friable soft tissue, which has a smooth, homogeneous, pure white cut surface.

The discrete nodules on the surface of the main mass show on section a pattern resembling cut twine. The pedunculated excrescence shows, in addition, three rounded, soft, hæmorrhagic areas (fig. 1).

Microscopic Investigation.

The following portions were fixed in formalin, embedded in paraffin, and stained in hæmatoxylin and eosin and by Van Gieson's method:—

- (1) From the larger, rounded lobule visible on the cut surface.
- (2) From the larger nodule attached to the capsule.
- (3) From the area of friable, pink tissue.

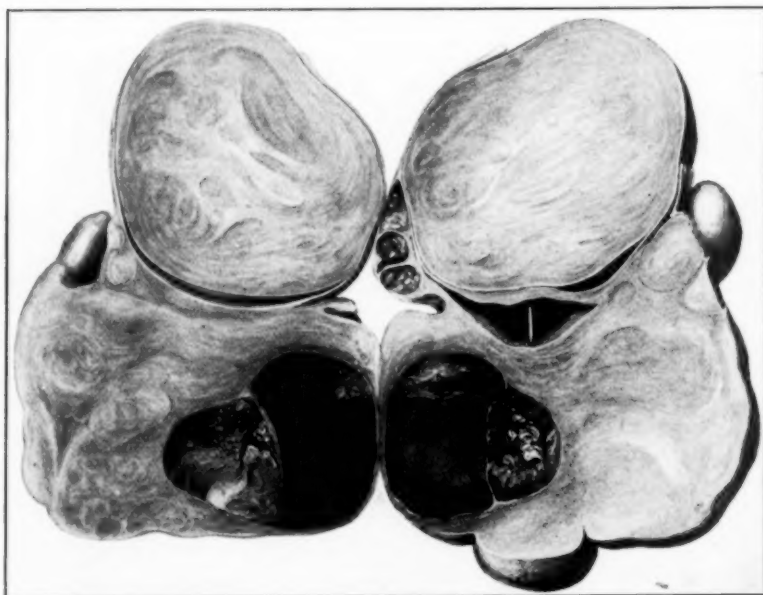


FIG. 3.

Longitudinal section of tumour, showing its interior and the cavities which were found on its section.

(4) and (5) Two portions, each including the wall and content of the cavity containing jelly and soft, white tissue.

(6) From the pedunculated excrescence on the surface on the mass.

The following portions were fixed in Müller's fluid, embedded in paraffin, and stained by the method of Weigert-Pal:—

(7) From the larger, rounded lobule visible on the cut surface.

(8) From the smaller nodule attached to the capsule.

(9) Including the wall and content of the cavity containing jelly and soft, white tissue.

(1) *Section from the large rounded Lobule seen on the Cut Surface.*—

The tissue consists of fibrillar bundles which are cut transversely or longitudinally. In transverse section each bundle consists of groups of delicate rings of collagenous substance, which is stained red by Van Gieson's method. The rings are round, rarely polygonal, they vary considerably in size. They enclose a rounded body which is stained yellow in Van Gieson. Nuclei in any bundle are relatively



FIG. 4.

From section 7. Illustrating the firm tissue. Bundles of medullated nerve-fibres: *a*, in longitudinal section; *b*, in transverse section. Stained by the method of Weigert-Pal. ($\times 222$.)

very few; they are small and round and lie within the rings. When cut longitudinally the bundles are seen to consist of very long parallel wavy cords of the yellow substance, each enclosed in a delicate collagenous sheath. The nuclei are relatively few; they are of elongated oval shape and lie within the sheath. The bundles obviously consist

of nerve-fibres, which are each surrounded by a sheath of Henle. This is very clearly shown in section 7 (fig. 4) which is stained by the Weigert-Pal method, the great majority of the nerves being medullated. The nerves are frequently moniliform. The tissue contains many capillaries; arteries with stout muscular walls are also present. The sections include the outer surface of the mass. Here a capsule is formed by nerve-fibres, the sheaths of which are considerably thickened.

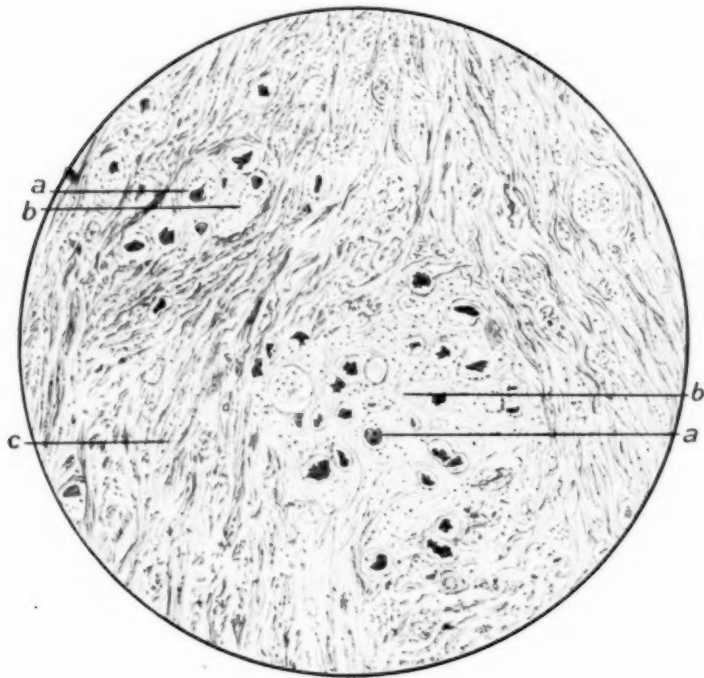


FIG. 5.

From section 2. Illustrating the firm tissue. Groups of ganglion cells, *a*, surrounded by delicate nerve-fibres, *b*; bundles of stout nerve-fibres, *c*. Stained by Weigert's iron-haematoxylin and van Gieson's stain. ($\times 63$.)

(2) *Section of larger Nodule attached to the Capsule.*—The centre of the nodule consists chiefly of nerve bundles, similar to those already described. Amongst them, however, there are groups of ganglion cells, or isolated ganglion cells (fig. 5). The ganglion cells are usually enclosed in a definite capsule. They have shrunk from their capsules and are

very irregular in shape. The protoplasm is not pigmented. Where nuclei are present, they are almost invariably eccentric and pyknotic. Many cells are merely represented by faintly stained granular debris. Around the ganglion cells is a zone of nerve-fibres in which the sheaths are more delicate than elsewhere. These delicate sheaths are stained a faint pink by Van Gieson's method. The periphery of the nodule has, under low powers, a fibrotic appearance. Under high powers,

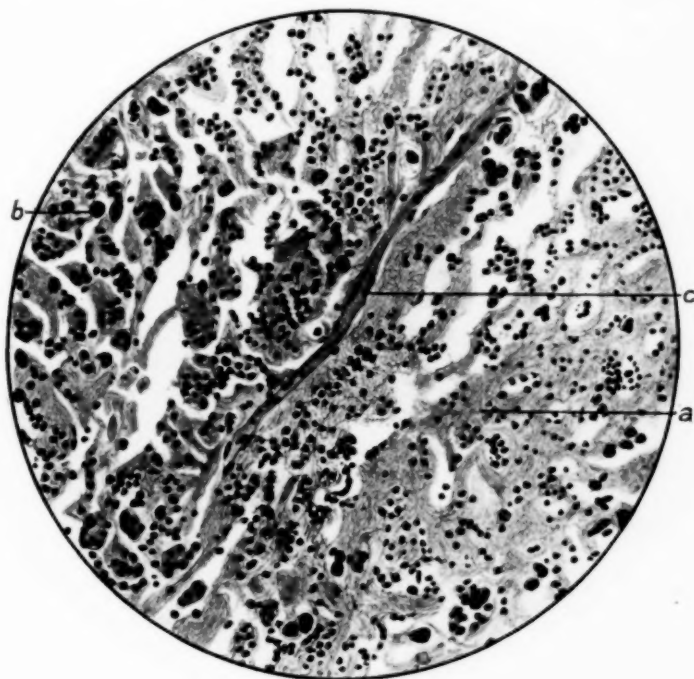


FIG. 6.

From section 3. Illustrating the soft, fibrillo-cellular tissue. Fibrils and small cells, *a*; fibrils and large cells, *b*; capillary, *c*. Stained with Ehrlich's hæmatoxylin and eosin. ($\times 222$.)

however, the fibres in this zone are seen to be nerve-fibres with a thickened sheath. In the extreme periphery there is some areolar tissue. In section 8, taken from a similar nodule attached to the capsule and stained by the method of Weigert-Pal, the nerves are almost all medullated.

(3) *From the Area of Friable, Pink Tissue.*—The section includes some of the firm tissue which surrounds the area. This firm tissue consists of bundles of nerves similar to those described in the first section. In addition there are large areas which are occupied by nerve-fibres with very delicate sheaths. In these areas there are numerous ganglion cells. The ganglion cells are almost all extremely degenerate. The friable tissue is separated from the solid tissue by a capsule. This capsule is stained deep red in Van Gieson. It consists of nerve-fibres which have greatly thickened collagenous sheaths. Trabeculae of similar tissue pass into the friable tissue. The friable tissue (fig. 6) has a matrix which is stained yellow in Van Gieson. This consists of a finely meshed net- or felt-work, of very delicate, ill-defined fibrils. It contains numerous nuclei which vary greatly in size. Very many of these nuclei lie in clear clefts between strands of the matrix. The majority of the nuclei are of about the size of lymphocytes and round in shape. These nuclei are deeply stained, their chromatin being arranged as a closely meshed net on which there are many nodes. Where the nuclei lie in clefts in the matrix they are seen to be within cells. The cells are round or polygonal. The nucleus is usually eccentric. The protoplasm is finely granular or vacuolar. It is, as a rule, very scanty, but may occupy as much as five-sixths of the cell. Occasionally a rod-like cell, or fibre, is occupied by a row of nuclei. Where the nuclei lie within the matrix it is frequently impossible to differentiate a cell body from the matrix. The large nuclei are almost all of irregular shape, deeply stained, and structureless. Very rarely the nucleus shows a net of delicate chromatin fibrils and a large nucleolus. The large nuclei may occupy an area corresponding to twenty-five or more red corpuscles. A cell body is more easily distinguished in the case of the large nuclei than the small. The protoplasm is more opaque and homogeneous and usually more abundant. The cells may be round or polygonal, but are frequently pear-shaped. In many cases the protoplasm is prolonged into a stout process which tapers somewhat abruptly. Some of these large cells are multinuclear. The friable tissue, therefore, is very similar to that of a glioma containing giant glia cells. Cross-sections of round fibres, such as formed the core of the nerves in the first section, can, however, be distinguished in places in the fibrillar matrix. There are also within it some strands of very delicate nerve-fibres which have no collagenous sheath, but are furnished at intervals with elongated oval nuclei. The tissue contains many capillaries, and there are areas of hæmorrhage. The

capillaries are lined by a layer of endothelial cells, which rest on a delicate basement membrane. There are no vessels with well-developed walls; in this respect the friable tissue contrasts with the firm neuromatous tissue which surrounds it.

(4) and (5) *Sections of the Cavity in which there was Jelly and Soft, White Tissue, and of the Hard Tissue round this Cavity.*—The appearances in these sections only differ from those in section 3 in minor respects. The firm tissue which surrounds the cavity is more fibrous in appearance, the collagenous sheath of the nerve-fibres being thickened. This tissue also contains calcareous deposits. The bulk of the calcium has been deposited in degenerate ganglion cells. The soft white tissue has the same fibrillo-cellular structure suggesting glioma. It contains, however, some vessels which have a stout wall formed by collagenous fibres. Vessels with a muscularis are not present. The growth is broken up by large deposits of the gelatinous substance. The latter is homogeneous, deeply eosinophile, and stained yellow by Van Gieson. It contains, in places, numerous red corpuscles. It is obviously coagulated; albuminous exudation. On the outer surface of section 4 there is some areolar tissue and a lymphatic gland. There are many nerve-fibres in the capsule of the gland. In section 9, which is stained by the method of Weigert-Pal, there are in the firm tissue numerous myelinated fibres, but the myelin is feebly stained. In the friable tissue there are no myelinated fibres.

(6) *Section from Pedunculated Excrescence on the Surface.*—This section also contains both definite bundles of nerves and fibrillo-cellular areas. A very few ganglion cells are also present. It differs from sections 3, 4, and 5 in that only one of the cellular areas is sharply defined by a capsule of nerve-fibres with thickened collagenous sheath. The other cellular areas are intermixed with bundles of nerve-fibres. The nerve-fibres either have a very delicate sheath, which is stained red in Van Gieson, or they have no collagenous sheath. The fibres in which this sheath is absent merge into the fibrillar matrix of the cellular areas. In these cellular areas the matrix is relatively scanty and most of the cells have a definite body. The protoplasm is very abundant in the larger cells. There is extensive hæmorrhage into the cellular areas. Some of the cellular areas lie very close to the outer surface of the nodule.

Summary of Macroscopic and Microscopic Examination.

The greater part of the mass consists of a firm tissue, which is composed of bundles of nerve-fibres. The fibres are almost all myelinated. They have a sheath of Henle which varies in thickness, but which is usually delicate. This tissue also contains groups of encapsulated ganglion cells; the nerve-fibres surrounding these cells have a very delicate sheath. The ganglion cells are almost all degenerate; some are necrosed and impregnated by calcium. The capsule of the tumour is formed by similar bundles of nerves in which the collagenous sheath is thickened; it is not formed by indifferent fibrous tissue. This firm portion of the mass has the structure of a simple "neuroma ganglionare" or "ganglio-cellulare." A firm, disk-like tumour composed in a similar manner of bundles of nerves and ganglion cells was found post mortem in the London Hospital Institute in a woman aged 34. It measured 11 cm. by 14 cm. by 5 cm., and lay in the concavity of the sacrum beneath the peritoneum (Post-mortem 954, 1910).

In the present tumour there are, however, also areas of soft, friable, partly hæmorrhagic tissue. These areas under the microscope are seen to be occupied by large numbers of cells which lie in a matrix consisting of a feltwork of fine fibrils stained yellow in van Gieson. The cells vary very greatly in size; the majority have a nucleus about the size of that of a lymphocyte and very little protoplasm. The structure bears a resemblance to that of a glioma in which there are some giant glia cells. Axis cylinders, however, and non-medullated nerve-fibres without a collagenous sheath can be recognized among the fibrils. There appears to be a transition from free cells to a fibrillo-cellular tissue, and finally typical nerve-fibres.

Tumours of similar structure connected with the sympathetic system, particularly the medulla of the suprarenals, have been described in the literature. Some of these tumours have been called glioma, and even lymphosarcoma or round-celled sarcoma, but Marchand [2], 1891, Wiesel [4], 1905, and Homer Wright [5], 1910, have demonstrated their true nature, showing that they resemble in structure early stages in the development of the sympathetic system in man and animals. To such tumours the name "neuroma embryonale sympathicum" has been given. The histological characteristics of these tumours, as tabulated and figured by Wright, are all present in this case, with the exception of definite "ball-like aggregations" or "rosettes."

This tumour is therefore a neuroma which consists chiefly of fully developed nerve-fibres and ganglion cells, but partly of embryonic sympathetic tissue. It is a "neuroma ganglionare sympathicum in partibus embryonale."

The neuromata of embryonic character are usually very malignant (Pick [3], 1911, Landau [1], 1912). Secondaries have been found in the glands, skull, ribs, liver, diaphragm, kidney, and other situations in a large number of the recorded cases. They are also characterized by a tendency to hæmorrhage and necrosis. In the present case there is hæmorrhage, particularly in the very cellular areas in the pedunculated excrescence on the surface of the main mass. In histological structure, therefore, the friable areas correspond to tumours which have been found to be malignant.

The tumour described here is a neuroma containing ganglion cells and connected with the sympathetic system; in the greater part the nervous tissue is fully differentiated, contains medullated fibres, and is benign in character; in places it is embryonic and histologically malignant. It may be designated "Neuroma ganglionare sympathicum medullatum et non medullatum, in partibus embryonale et forsitan malignum."

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Half of a Broken Glass Catheter removed from the Bladder.

By ARTHUR H. N. LEWERS, M.D.

DR. LEWERS showed half a broken glass catheter, which he had removed from the bladder under the following circumstances: He was called down to the London Hospital to see a case of difficult labour, due to marked contraction of the pelvis. He decided to perform Cæsarean section, and, as a part of the usual routine preliminary in any case of abdominal section, a catheter (which was a glass one) was passed by a most experienced nurse. The patient was having strong labour pains, and while the catheter was in the bladder a pain came on, and the patient strained violently. As a consequence, the catheter was broken, and about half of it remained in the bladder. Dr. Lewers performed the Cæsarean section, which presented no unusual feature. During the operation he cautiously felt in the hypogastric region to see if the catheter was palpable. He did not, however, feel it, perhaps because he refrained from pressing at all hard for fear of injuring the vesical mucous membrane with the broken end of the catheter. When the Cæsarean section was finished, the patient was placed in the lithotomy position, and an attempt was made to seize the catheter with a pair of small Wells's forceps without dilating the urethra. Although the catheter could be grasped with the forceps, he could not extract it without, as it seemed to him, grave risk of breaking the catheter. Accordingly he dilated the urethra with Hegar's dilators, and passed the left forefinger into the bladder; the broken end of the catheter was then identified, and seized with Wells's forceps, and so extracted.

The patient made an uneventful recovery, and had no trouble as regards micturition after the operation, neither pain nor any incontinence of urine.

Dr. Lewers said the position of any long, narrow foreign body in the bladder was a horizontal one, more or less transverse from left to right. He had removed hairpins from the bladder on other occasions. In one case he had a radiograph taken previously, which showed the hairpin lying transversely across the bladder. In another case, where there was a hairpin in the *uterus*, a radiograph showed the position of the hairpin to be vertical with the blunt end upwards. Of course, a

radiograph did not in itself tell us whereabouts in the pelvis a foreign body lay; it was therefore important to bear in mind that, if the foreign body lay in a transverse or horizontal position, it was probably in the bladder, while a more or less vertical position indicated that it was probably in the uterus. He had never met with a case before where a glass catheter had been broken in the bladder. In future, in the case of patients in labour under his care, he had given instructions that glass catheters were not to be used.

DISCUSSION.

Dr. HERBERT SPENCER said he was surprised to hear that a glass catheter was used. He thought a gum elastic catheter should always be employed during labour. He noticed that the catheter was broken about the middle transversely, no doubt by the sudden movement while the upper part was fixed by the child's head. The weakest part of the ordinary glass catheter was at the bend; for this reason he always used a straight glass catheter which was easily made from glass tubing with a file and a Bunsen burner, and could be conveniently sterilized in a test-tube containing distilled water and plugged with wool. He had broken a glass catheter in the bladder in a case where there was some obstruction by forceps applied to the broad ligaments (many years ago) in performing vaginal hysterectomy. The broken piece was easily removed through a Kelly's tube. But he suggested that in Dr. Lewers's case it might possibly have been removed by simply passing forceps into the bladder through the urethra and manipulating the catheter into the jaws of the forceps through the wall of the bladder *per abdomen*, a method he had adopted to draw the probe holding the thread attached to the upper end of the cut urethra in order to draw the upper end into the lower for anastomosis.

Dr. MACNAUGHTON-JONES said that he had published a somewhat similar unfortunate experience of a catheter having been broken in the bladder. He had removed a urethral cyst of considerable size, and reconstructed the urethra. The patient, who weighed some 14 st., was lifted from the operating table with a glass catheter in the bladder. In the movement the catheter was broken, nearly half remaining in. By suprapubic cystotomy the following day the broken portion was removed. There was no further trouble.

Dr. HEYWOOD SMITH remarked that the catheter seemed to be made of thinner glass and of smaller calibre than that generally used.

Uterus removed after "Utriculoplasty."

By CUTHBERT LOCKYER, M.D.

IN April, 1911, Dr. Victor Bonney read a paper entitled "Six Cases of Utriculoplasty for Uterine Hæmorrhage, one of which was followed by Pregnancy and Labour." The author's results were very encouraging, and in view of the fact that pregnancy and labour had followed the operation, its justification from this point of view alone seemed thoroughly established.

The day after Dr. Bonney read his paper a patient came to Dr. Lockyer's clinic at the Samaritan Hospital giving a history of uterine hæmorrhage and repeated curettings, and the speaker decided that this was a suitable case for the operation of utriculoplasty. The patient's history is as follows: F. C., aged 33, single, sent to the Samaritan Hospital by Dr. Skeyne, of Kensal Rise, on April 7, 1911, for uterine hæmorrhage. The patient's statement was that she was "nearly always losing and had done so for years." In October, 1908, when she was a patient of Dr. Wallace, of Battersea Rise, the patient was curetted by Dr. Arthur Giles, after which the bleeding was lessened for a few months only. She then became an out-patient at the New Hospital for Women, was finally admitted and curetted by Miss Chadburn in November, 1909. This second curettage brought no relief, and after treating the patient with uterine hæmostatics for one month with no cessation of the hæmorrhage, Dr. Lockyer decided to operate. In May, 1911, the abdomen was opened, the uterus drawn up, and a wedge-shaped portion marked out which had as its base nearly the entire fundus and as its apex the internal os. The portion to be removed having been grasped with a volsellum, it was removed by two incisions passing through the entire thickness of the uterus and including both the anterior and posterior uterine walls. The mucosa, which was thickened, was then scraped away with a Volkmann's spoon, the muscle walls were then approximated accurately with mattress sutures of fine silk, and the peritoneal coat apposed by Lembert's sutures of the same material and the abdomen closed.

The patient made a rapid and easy recovery.

The periods commenced again on June 19, 1911, accompanied with a

variable amount of pain. The patient kept the following account of her symptoms during the next month :—

June 19	...	Dull pain	...	...	...	2 towels
" 20	...	"	...	...	...	2 "
" 21	...	Sharp pain	...	...	...	3 "
" 22	...	Less pain	...	...	...	4 "
" 23	...	"	...	...	...	4 "
" 24	...	Pain very bad	...	...	...	6 "
" 25	...	" "	...	...	...	6 "
" 26	...	Occasional pain	...	...	...	5 "
" 27	...	" "	...	...	...	4 "
" 28	...	Dull pain	...	...	...	4 "
" 29	...	"	...	...	...	4 "
" 30	...	"	...	...	...	2 "
July 1	...	Period ceased	...	...	...	1 "
" 14	...	Period commenced; very sharp pain	...	...	...	2 "
" 15	...	Less pain	...	...	...	4 "
" 16	...	"	...	...	...	4 "
" 17	...	Dull pain	...	...	...	3 "
" 18	...	"	...	...	...	3 "
" 19	...	Period ceased	...	...	...	2 "

The patient was given ergot and styptol alternately, but without improvement in the symptoms, accordingly panhysterectomy with conservation of the ovaries was performed on January 1, 1911, from which the patient made an uninterrupted recovery.

In February she complained of rectal hæmorrhage. She remained in St. Mark's Hospital for fourteen days in March under the observation of the late Sir Frederick Wallis, who examined with the sigmoidoscope but could find no lesion, nor was any bleeding observed whilst in hospital. During April the patient had been taking calcium lactate and there had been no hæmorrhage complained of for the past month.

The uterus on removal showed no signs of the line of union. It was a small cylindrical organ of nearly the same size top and bottom; the tubes nearly met in the mid-line, and on slitting up the anterior wall the deep fine silk sutures showed up as the muscle retracted; the mucosa was extremely thin, in sharp contrast to its state at the time of the utriculoplasty. The speaker did not wish to disparage the latter operation, but thought the case should be recorded to show that this procedure is not to be considered infallible in all instances.

The measurements of the wedge removed were not taken, but it was as wide at its base as the fundus would allow and vertically it reached to the internal os. Microscopically, Van Gieson's stain revealed an excess of fibrous tissue.

DISCUSSION.

Dr. GRIFFITH asked Dr. Lockyer if he had verified the patient's statements as to her hæmorrhage, both from the uterus and the bowel. If, as it appeared, this operation failed, the operation of curetting would obviously be worthless, and in these, as well as in cases of uterine fibroid, he had given up curetting entirely. In the April number of the *Proceedings* (Electro-Therapeutical Section, p. 125) would be found Dr. Bordier's paper on the "Radio-therapeutic Treatment of Uterine Fibroma," and the discussion which followed it. Dr. Griffith had on that occasion stated the objections that seemed to him most weighty against that method of treatment, and they seemed to him to apply equally to these cases.

Dr. TATE referred to two cases in which he had performed the operation of utriculoplasty. In the first case the patient had had curetting performed on three occasions within a period of six years, and had been latterly quite incapacitated from doing her household duties. Three months after the last operation utriculoplasty was done owing to the hæmorrhage being persistent. Amenorrhœa occurred for fourteen weeks after this operation, and then the periods recurred at shorter intervals, and continued for increasing length of time, varying from fourteen to twenty-eight days. She was then readmitted to the hospital, profoundly anæmic, and vaginal hysterectomy was subsequently performed. The second patient was operated upon in July, 1911, having previously been curetted three times. After the operation she had amenorrhœa for seven months, but from February up till the present time she has steadily improved, the last period in April being quite normal in amount and duration.

Sir FRANCIS CHAMPNEYS said that he wondered why, in cases of obstinate uterine bleeding, after the failure of curetting, a trial was not oftener given to Dr. Atthill's treatment by nitric acid applied to the uterine cavity, before extirpating the uterus. The action of nitric acid was powerful, but superficial. He had used it for some fifteen years, with very good results, and had saved more than one intended hysterectomy. The cases must, of course, be properly selected, but in his own cases he had hardly had a failure. No ill consequences had resulted, except in one case in which the practitioner in charge of the patient had failed to remove the tampon soaked in sodium bicarbonate from the vagina, and superficial ulceration of a part of the vagina had occurred. He thought it ought to be tried much oftener than it was at the present time.

Dr. A. W. RUSSELL said he was specially interested in the specimen which Dr. Lockyer had described, as he had done the operation of utriculoplasty some time ago on a patient who had been very indignant that his original suggestion of hysterectomy had not been carried out. He did not expect ever to see her again, but she had appeared the other day to report that there had been no

improvement in her symptoms. The uterus, when examined, showed marked fibrosis. She was now waiting admission for vaginal hysterectomy, which seemed to him the only resource for such cases. He could not understand the logic of removing a wedge from the uterine body for the cure of a disease that pervaded the whole uterus. Utriculoplasty was a pretty operation, but could only be suitable in the rare cases of menorrhagia from a bulky uterus with roomy cavity, but otherwise healthy.

Dr. LEWERS said he thought, as had been said by Sir Francis Champneys, that the application of fuming nitric acid to the endometrium was often an effectual treatment in persistent metrorrhagia in cases of what might be called chronic uterine hypertrophy, or uterine fibrosis. It was at all events worth trying before deciding to perform hysterectomy. It should be borne in mind, however, that the application of nitric acid in this way was occasionally followed by an actual obliteration of part of the uterine cavity. He had known this to happen in one of his own cases, where, some twelve months after the application, he had occasion to examine the patient, and found that the sound would only pass for a distance of $1\frac{1}{2}$ in.

Dr. MACNAUGHTON-JONES said that with regard to nitric acid, he had for many years employed it from the time when Dr. Atthill first advocated its use in endometritis and for hæmorrhage. Of late he had given it up, for curettage with internal medication, in suitable cases, was as effectual. He had never had any bad effects from nitric acid, the uterine cavity being well dilated, and the precaution taken of carrying a strip of gauze, well saturated with oil, into the uterus. Utriculoplasty must be, unless the pre-existing pathological condition be known, an experimental step, for obviously, in cases in which the pathological change involved the wall of the uterus, such as fibrosis, or adenoma, and was outside the endometrium, it could not cure.

Dr. HANDFIELD-JONES thought that the operation was in the highest degree unscientific, as it removed only a portion of diseased tissues, and gave no guarantee that the troublesome symptoms would not return. Every surgeon was anxious to find some means of dealing with these troublesome cases of uterine hæmorrhage, and to avoid the necessity of removing the whole uterus. While recognizing the value of nitric acid applications to the endometrium, and the good effects of steam, he had found in his own experience that the use of X-rays gave excellent results in this difficult group. He thought that this mode of treatment had a direct action on the uterine tissues, and did not act solely by sterilizing the ovaries.

Extraperitoneal Cæsarean Section.

By A. W. RUSSELL, M.B.

THE limit of time for a short communication makes it impossible for me to be historical, even though the operation in a popular sense is only five or six years old, or to describe the variations in its methods already recommended by different operators. Fortunately I do not need to give such an exposition to the members of this Obstetrical Section. The literature of the subject must be familiar to all of us, at least in the admirable summaries by the editorial staff of *The Journal of Obstetrics and Gynecology of the Empire*.¹ I have not heard of any direct British experience of the operation other than what has been published by Dr. Tweedy in his paper in the above-mentioned journal for August, 1911, and in my paper in the *Practitioner* for February, 1911.² These two papers describe, I think with sufficient clearness and detail, two of the leading varieties of the operation, and attempt to fix its scope as an obstetrical operation.

Döderlein has described and illustrated a method of extraperitoneal section through an oblique lateral opening extending down to, but not through, the peritoneum, from the anterior superior spine to the middle line, slightly above and parallel to Poupart's ligament. This route has the advantage of avoiding free manipulation of the bladder, though it seems to me to bring the operator dangerously near other important structures such as the ureter and the uterine vessels of the side on which he is operating.

The method practised by Tweedy in his cases would be more correctly described as transperitoneal, as he cuts through the parietal peritoneum, reflects the uterine peritoneum upwards to lay bare the muscular tissue of the anterior wall of the lower uterine segment, and stitches these two layers together right out to the angles of the wound; so it is only at this point that his method becomes essentially extraperitoneal.

A third variation is the method which I have adopted in all my cases. Its successive steps, briefly stated, are Pfannenstiel's transverse slightly crescentic incision just above the symphysis pubis through the

¹ *Journ. Obstet. and Gyn. Brit. Emp.*, 1911, xx, pp. 47-51.

² *Practitioner*, 1911, lxxxvi, pp. 206-13.

skin to the fascia covering the recti muscles, the reflection of this flap from the surface of the muscles by blunt dissection with an occasional snip of the scissors, the separation of the muscles in the middle line, the distension of the bladder with 6 oz. to 10 oz. of sterile saline solution so as to make its contour prominent, the blunt dissection of the bladder from the anterior wall of the cervix, with gauze swab over finger, and the emptying of the bladder and holding it aside with a retractor so as to allow median longitudinal incision of the lower segment of the uterus. Then follows extraction of the infant either with the help of the forceps or one of its blades, or by pressure or expression from above, or by pulling out a leg if there is a breech presentation. This, as I have said, is the method that I have practised in the six cases upon which I have based this communication.

In the cases that I have briefly summarized for my present purpose in the tabular form accompanying this communication I have included the first case in which I attempted to do this operation, to illustrate its connexion with the classical method, and also to give me the chance of mentioning that the patient, Mrs. M., was again admitted into the Maternity Hospital in labour about a month ago and was delivered by the ordinary method of Cæsarean section in the clinic of my colleague Professor Munro Kerr. The former uterine wound was so satisfactorily healed that no sign of it remained, there being only some slight peritoneal adhesions low down. The other six cases were deliberately arranged and completed as extraperitoneal Cæsarean sections.

These seven patients had all of them pelvic deformity; they were all more or less advanced in labour, two of them for three days or more, while others were indefinite as to their earlier stages and certainly irregular in their course; they had all of them been handled; at least two of them had a temperature at the time of the operation; two had other complications, such as hydramnios and lateral placenta prævia. The patient who died as I was completing the operation was operated on after a harassing experience to herself, the first report of irregularity and weakness of fetal heart being accepted without question, and the patient submitted to the full test of labour in the hope that the cervix would dilate and moulding of the head take place, craniotomy being then the alternative to spontaneous delivery. When some hours later the fetal heart was found by me to be regular and strong I decided at once to perform the extraperitoneal operation, and but for the accident of the anæsthetic I believe that this patient would also have done well, as there was no trouble in the operation.

TABLE OF CASES OF EXTRAPERITONEAL CÆSAREAN SECTION.

No.	Name, &c.	Previous history	Present history	Indications for operation	Operation	Child	Course of the case	Result
1	Mrs. M., aged 28, III-paræ, slightly rickety (begun as extraperitoneal operation, but completed by ordinary incision of uterus; included here for other points)	Two previous labours in Glasgow Maternity Hospital: (1) Admitted with head born and shoulders impacted; eclampsia; (2) Induction of premature labour about thirty-seven years ago, but craniotomy required to complete delivery; both children weighed about 8 lb.	Admitted February 18, 1910, in labour; last menstrual period, June 8, 1909	Contracted pelvis, especially right side; C.D. 3½ in. (9.5 cm.); membranes ruptured for some time; on admitting one finger; pubiotomy rejected because of irregularity of bones and thickness of symphysis	Pfannenstiel's suprapubic transverse incision, but as this seemed to be too high and the bladder, when filled, had not come above the brim, the peritoneum was incised longitudinally and the usual intraperitoneal incision of the uterus was made, the peritoneal cavity packed off with gauze swabs, and delivery completed as in classical operation	Living female, 7 lb. 14 oz.; 19 in.	Temperature over 100° F. and pulse quick before the operation; rose to 100.6° F. at end of first day and again to 100.8° F. on fourth day; otherwise under 100° F.	Mother and child dismissed well in twenty-nine days
2	Mrs. S., aged 23, II-paræ, rickety	First pregnancy ended in abortion at three and a half months	Admitted March 16, 1910, not in labour; abdomen unduly enlarged from about sixth month; last menstrual period in middle of June, 1909; hydramnios	Contracted pelvis, especially on right side; C.D. almost 4 in. (10 cm.); membranes ruptured for ten hours; on admitting two fingers	Extraperitoneal Cæsarean section on March 24, 1910; small opening in peritoneum at once shut off by pressure forceps and then stitched; peritoneum accidentally torn after birth of child by assistant momentarily forgetting technique and pulling out uterus, which was at once replaced and the rent stitched up	Living male, 8½ lb.; 19 in.	Temperature rising daily to 100. 101° F. for six days and again on eighth day	Mother and child dismissed well in thirty-five days

3	Mrs. T., aged 27, 1-para, rickety	Nothing to note	April 24, 1910; admitted in labour for three days; membranes ruptured for two days, and os fully dilated; head not engaged and markedly overlapping; trace of albumin in urine	Contracted pelvis; C.D. 3½ in. (9.5 cm.); advanced stage of labour; membranes long ruptured	Extraperitoneal Cesarean section on April 24, 1910; peritoneum slightly torn at two places and stitched at once	Living female, 8 lb.; 21 in.	Temperature 100.10° F. at operation, falling slightly to third day, then rising to 101.8° F. in next two days and to 101.4° F. for three days, afterwards about normal; wound suppurated at right corner, but ultimately strong union	Mother and child dismissed well in forty-four days
4	Bessie N., aged 21, 1-para, unmarried, rickety	Nothing to note	Admitted October 8, 1910, not in labour; head free above brim; membranes apparently not ruptured, but says that she lost a quantity of "waters" yesterday; low implantation of placenta on left side	Contracted pelvis; C.D. 3½ in. (9.2 cm.)	Extraperitoneal Cesarean section on October 10, 1910; no hitch in technique	Living male, 7½ lb.; 21½ in.	Temperature rose to 99.8° F. on first day, never afterwards over 99.2° F., excepting one rise to 101.2° F. on thirteenth day	Mother and child dismissed well in twenty-four days
5	Mrs. McC., aged 28, 1-para, rickety	Subject to rheumatism and anemia	Admitted August 13, 1911, in labour more or less for four days; membranes said to have been ruptured since beginning of labour; os admits one finger; head markedly overlapping; last menstrual period early in November, 1910	Contracted pelvis; C.D. 3½ in. (9.5 cm.); advanced stage of labour; membranes long ruptured	Extraperitoneal Cesarean section on day of admission; peritoneum torn slightly but protected temporarily with swab; interrupted sutures in uterus, continuous suture elsewhere	Living male, 5½ lb.; 20 in.	Temperature never above 99.3° F., and pulse seldom as high as 90° F.	Mother and child dismissed well in twenty-three days
6	Mrs. S., aged 22, 1-para, rickety	First labour in Glasgow Maternity Hospital; instrumental delivery; child dead	Admitted September 30, 1911, not in labour; head markedly overlapping	Contracted pelvis; C.D. 3½ in. (8.8 cm.)	Extraperitoneal Cesarean section on October 1, 1911; no hitch in technique	Living female, 7 lb.; 20 in.	Temperature on first day 99.2° F., always under 99° F. afterwards; pulse 60-75	Mother and child dismissed well in twenty-five days
7	Mrs. N., aged 37, 1-para, no deformity noted	Nothing to note	Admitted February 15, 1912, in labour since the previous evening; membranes ruptured since midnight; cervix rigid; fetal heart reported to be irregular	Contracted pelvis; C.D. 3½ in. (9.5 cm.); fetal heart strong and regular; rigidity of cervix; advanced stage of labour; membranes long ruptured	Extraperitoneal Cesarean section on day of admission; no hitch in technique	Living female, 6½ lb.; 19 in.	Mother died under chloroform as abdominal wound was being closed	Child dismissed well in three days

With regard to morbidity, it should be noted that the later cases ran practically an afebrile course while the first cases had some temperature and the wounds gave trouble. In all the cases, however, the wounds were ultimately quite strong.

Let me now complete this communication by giving you certain conclusions that I have reached as a result of these experiences:—

(1) Extraperitoneal Cæsarean section is not an alternative to the ordinary classical operation. Its technique is undoubtedly more complicated and it usually takes a little longer time, but it should never cause difficulty to the trained surgical gynaecologist. The classical operation should be chosen for ordinary cases, and the extraperitoneal operation should be complementary to it and reserved for cases advanced in labour with the lower uterine segment stretched by the overlapping head or the impacted shoulder or for certain cases of placenta prævia, the child being still alive.

(2) The healing of the wound has been proved to be quite as satisfactorily secured as in other methods when the right technique is employed. The different structure of the lower uterine segment and cervix favours healing because it is not subject to the disturbing contractions of the uterine body. Even when there was a little suppuration of the wound, as in my first three cases, the disturbance was local and the wounds were ultimately as completely healed and strong as the others.

My only two deaths after Cæsarean section in a series of nearly fifty cases resulted recently from acute sepsis within five days after operation. Both were due to intra-uterine infection and were from previous history of handling considered safe for the classical operation. I am quite certain that the patient stands a much better chance of her life with an infected uterine wound if it is extraperitoneal.

(3) The risk of hæmorrhage is certainly not greater. I think I am warranted in saying it is usually less. Döderlein's case of serious hæmorrhage necessitating recourse to the ordinary method may have some relation to the lateral incision.

(4) There is no risk of hernia or of intestinal complications.

(5) To me perhaps the most important consideration of all is the added scope that this method gives for the attainment of the ideal of Cæsarean section—the saving of the life of the child as well as that of the mother. The scope of the ordinary operation is gradually widening, but there will always be cases that have advanced too far in labour and have been handled too freely for the ordinary Cæsarean section to be undertaken without undue risk.

There are certain cases, too, of impacted, neglected, transverse or oblique presentations, central placenta prævia, and even such a complication as the obstructing retraction ring, which come only or best within the scope of this operation.

DISCUSSION.

Dr. HERBERT SPENCER said the Section heard with great interest this communication from Dr. Russell, who had had such success with the ordinary Cæsarean section. It remained to be seen, however, whether Dr. Russell would be so enthusiastic when he had had a greater experience with the extraperitoneal operation. He reminded the Section of Bumm's enthusiastic statement in the early days of his experience that no one who had done the extraperitoneal operation would ever afterwards do the classical operation: recently he had admitted that it was a very imprudent statement. Dr. Spencer would carefully consider Dr. Russell's cases when they were published. He would like to ask how many of the cases healed by first intention, and how long it took to deliver the child (which could easily be delivered in one minute by the classical operation). He also reminded the Section that Döderlein had had to abandon the method in one case owing to hæmorrhage and that the peritoneum and bladder had been accidentally opened in several instances. Personally, he would just as soon operate by the classical operation on a patient who had been examined as on one who had not been examined; but in cases which were really affected the extraperitoneal operation had failed to save the patients; such cases required the section to be followed by hysterectomy.

Mr. WILBERFORCE SMITH said that two things which impressed him from what he had seen of the operation were: firstly, that the results of the extraperitoneal operation could never be compared with those of the classical Cæsarean section, because it could only be performed in the advanced stage of labour when the cervix was fully dilated, as the incision had to be placed in the lower uterine segment; and there being a much greater likelihood of infection in these cases, the results would differ from those of the intraperitoneal operation performed under more favourable circumstances. Secondly, the difficulty of the operation might be very considerable, particularly in separating the bladder from the cervix and exposing this. He had seen a distinguished German gynæcologist, having delivered a lecture on the advantages of the operation, take a quarter of an hour to open the uterus, after opening the bladder on the way, thus showing how difficult the operation may sometimes be.

Dr. RUSSELL, in reply, said he could never regard any of the extraperitoneal methods as a mere alternative to the usual classical operation, which was so simple that some unaccustomed to surgical procedures had done the

operation successfully. The operation he had described demanded surgical skill and training, and was indicated in certain special circumstances when the ordinary operation could not safely be undertaken. He had emphasized that in his paper. There was no reason why there should be any more morbidity in this operation than in any other. As to the quick delivery of the child, a few minutes of delay could have no effect on its vitality or viability.

Embryotomy after Version for Placenta Prævia.

By CUTHBERT LOCKYER, M.D.

At 1 a.m. on the night of February 9 last, I was asked by Dr. Hardie, of Barnet, to go to a patient in labour who was suffering from *ante-partum* hæmorrhage. Dr. Hardie and Dr. Basil Rooke had examined and found the os admitted two fingers, and they could both feel the placenta. I arrived at 1.30 a.m. and found the patient in labour, losing fairly freely, but with a good pulse.

On examination I discovered the placenta overlapping the posterior segment of the os, which admitted my two fingers. In front of the edge of the placenta I felt the vertex through the bag of membranes. The latter were not bulging. The pains grew stronger as the result of examination and a good deal of blood escaped. An anæsthetic was given, the patient placed on a table in the lithotomy position, and the external genitals shaved and cleansed. The vagina was then cleared of clots and douched. I next proceeded to turn, in order to bring down the half breech and check the hæmorrhage from the placental site. The child was a full-term fœtus and well developed; it presented in the first vertex position. It was quite easy to push the head out of the brim towards the left iliac fossa, but there was some difficulty afterwards in pushing the shoulder in the direction of the head. The right elbow and forearm dropped back over the os several times after I had pushed them to the left. This was no doubt due to the difficulty in getting the long axis of a big fœtus into the transverse axis of the uterus. At this stage Dr. Hardie rendered help by pressing on the breech with both his hands overlaying my left external hand, and in this way the head and shoulders went up on the left side, and the breech came within reach of my examining fingers on the right. I seized the left foot, ruptured the membranes, and brought down the left half breech, and the bleeding ceased. It was obvious from the presenting leg that the child was

strong, large, and well formed, its muscles were firm and resistant. Traction was made on the leg for nearly two hours, the cervix was very resistant, and I could not even feel the anus after an hour's traction. After strong continuous traction for an hour and a half the fœtus made a violent convulsive movement, and then the leg became pale and flabby. There was no doubt in my mind that the child had died; but the cervix would not yield, and I could not get even a finger through the os to bring down the other foot. Feeling certain of the death of the fœtus, I decided to reduce the size of the fœtal breech by incising the pelvic bones. I passed one blade of a pair of long, stout, curved scissors up the anus, and cut upwards and outwards across the iliac bone. I then threaded a cord through my incision and out above the great trochanter, dislocated the head of the femur, and with forward and upward traction on the threaded cord the breech was delivered. There was some further trouble with the shoulders, the arms were extended, so I divided the scapular muscles of the right anterior shoulder, after which it came down easily. The trunk was then held well forward and the left posterior arm delivered. Owing to firm fundal pressure the head was not extended, and was delivered by jaw traction and fundal pressure. The placenta was expelled spontaneously; it was flattened out and thin. The membranes were not adherent and came away entire. The perineum was torn in a curious manner. The vaginal mucous membrane escaped laceration, but the perineal body and skin sustained a \wedge -shaped tear, the apex of which was at the fourchette, and the two limbs of which diverged to either side of the anus. The transverse perineal artery spurted freely. Three stitches were inserted, a hot vaginal douche was given, and a sterile dressing applied to the perineum. Ernutin, 15 minims, was given into the buttock, and the patient put back to bed at 5 a.m. The pulse was of fair tension with a frequency of 108. I stayed with the patient for about an hour. The uterus contracted well, and there was no *post-partum* hæmorrhage.

The patient's past history is as follows (these notes are kindly supplied by Dr. Hardie and Dr. Basil Rooke): Mrs. X., aged 38, married nine years. Thyroid gland removed twelve years ago for exophthalmic goitre. Confinements: 1904—Placenta prævia at seventh month delivered by version; child stillborn; *ante-* and *post-partum* hæmorrhage. 1907—Dead child at seventh month; phlegmasia alba dolens of both legs; in bed for six months. 1912—Last menstruation May 8, 1911; threatened to miscarry at fifth and eighth months. Hæmorrhage started on January 24, ceased, but commenced again on

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February 4, and continued until February 9, midnight; Braxton Hicks podalic version for marginal placenta prævia; embryotomy. February 29: Patient doing well; lochia has been normal.

Before communicating with me Dr. Hardie had asked consent to perform Cæsarean section, as the patient had already lost two children and was in her thirty-ninth year. Had he obtained consent I should have agreed to do this. It is the first time in my obstetric experience that I have been confronted with a *full-term* child in a case of marginal placenta prævia: the foetus weighed 9 lb.; the cervix was resistant; the placenta was obstructive. I do not know how foetal life could have been saved. The cervix might have been divided at the end of one hour's traction with a better result to the foetus; and this is the point I wish especially to raise. In all obstetric operations the exercise of patience is our stand-by, but in a case like this it is hard to tell just how much a foetus will tolerate. The violent foetal convulsion coincided in point of time with the introduction of my fingers into its anus during an exploration, and after assuring myself of foetal death my only aim was to hasten delivery, and therefore I proceeded to perform "embryotomy," but my chief regret is that the child was not rescued by Cæsarean section.

May 2, 1912: Dr. Hardie writes to say this patient is quite well in health.

DISCUSSION.

Sir FRANCIS CHAMPNEYS said that Dr. Lockyer had mentioned his interesting experience to him some time ago. He must congratulate him upon the skill with which he had performed a difficult obstetric operation, but he was not quite sure that the necessity had arisen for performing it. It must be remembered that Dr. Braxton Hicks's advice in such cases had been to do bipolar version and not to use traction unless special need arose. After version was completed the bleeding almost invariably stopped. By traction in the present case, it appeared likely that the cervix had become irritated, and the difficulty arose. He confessed that he should have treated the case originally by bipolar version without traction (as there was no bleeding). If tonic contraction had arisen he would have given opium freely. He said opium advisedly rather than morphia, nepenthe, and other derivatives, because opium seemed specially created for midwifery. It was a compound drug with various constituents of various action, and the system seemed to select the particular ingredient which was best at the time. For instance, in cases of prolonged first stage, which had perhaps lasted well into the night, it sometimes became

highly desirable that the labour should either cease for a time or be quickly terminated. If opium (laudanum), for instance, was freely given, say in doses of twenty drops repeatedly, one of two things happened: either the patient got refreshing sleep and the labour started with renewed vigour, or the opium acted as an oxytocic, and the labour became vigorous and ended in rapid delivery. He had repeatedly known it produce this effect unexpectedly, and the practitioner ought to beware of leaving the house in expectation of the patient sleeping until he was sure that the sedative, and not the oxytocic action, was going to be the one selected. Unless he was careful the baby might be born soon after he left the house. He had found opium of great service in a case of placenta prævia with slow dilatation.

Dr. HERBERT SPENCER agreed with Sir Francis Champneys that powerful traction should not be made after version. If left alone the uterus would expel the fœtus without any difficulty, usually within three hours, but almost always within five hours; he had only known one case take so long.

The Clinical Significance of Acidosis in Pregnancy.

By WALTER C. SWAYNE, M.D.

THE occurrence of acidosis has for some time been recognized as a phenomenon connected with the special toxæmias of pregnancy, and in this paper an effort is made to show how its presence can be ascertained by tests which are not too complicated to be carried out in clinical practice, and how the diagnosis and treatment of the case may be influenced by its occurrence.

It should be explained before going any further that the methods described are not intended to produce absolutely accurate results from the point of view of the physiological chemist, nor is any attempt made to deal with the affections mentioned from the point of view of the pathologist, or to advance any theories as to the ætiology of the disturbance of metabolism which leads to the production of acidosis, but simply to record the results of the investigation of a series of cases, and the suggestions as to the treatment of the causative condition which seem to be the result of the investigations.

Acidosis is used as a term signifying an alteration in the ammonia-urea nitrogen ratio in the urine, accompanied by the presence of acetone and diacetic and β -oxybutyric acids.

The quantitative estimations used are not absolutely accurate, but

are sufficiently so for clinical purposes, and the amount of inaccuracy (which is not great) when it occurs in the same case under such conditions, for example, as before and after delivery, does not affect the comparisons to any material extent. For the methods of quantitative estimation used I am indebted to Dr. Herapath and Dr. R. E. Thomas, late of the Bristol Royal Infirmary; and the actual estimations have been worked out by Dr. R. S. S. Statham, Resident Obstetric Officer to the Bristol Royal Infirmary, and confirmed, in many cases, by Professor Kent and Dr. Bywaters, of the Department of Physiology of the University of Bristol.

Leith Murray [2] in his paper on the "Toxæmias of Pregnancy," alludes to the occurrence of acidosis in cases of vomiting of pregnancy and in eclampsia, and states that these two forms of pregnancy toxæmia, while not necessarily due to the same toxin, are probably due to the same *type* of toxin. It is not, however, in this paper proposed to do more than call attention to Leith Murray's investigations, since these are more particularly concerned with the pathological conditions found, but rather to point out the clinical importance of the occurrence of acidosis.

Acidosis occurs in diabetes, in which its occurrence was first noted, and in the following other conditions (A. R. Short [5]): starvation, periodic vomiting of children, delayed chloroform poisoning, severe vomiting of pregnancy, and the pregnancy toxæmia which terminates in eclampsia. Two of the conditions named are, as Leith Murray has shown, the result of a toxæmia specially occurring during pregnancy. To refer to some of these conditions in detail:—

Diabetes is accompanied by a marked acidosis, and pregnancy not infrequently occurs in a woman suffering from this disease. Just as muscular exertion may precipitate an attack of diabetic coma due to the increase of the acidosis, so may the muscular strain of labour do so, and consequently labour in a diabetic woman should be looked upon as a grave risk and every possible precaution taken to render it as free from exertion as possible.

The administration of chloroform as an anæsthetic will produce an acidosis in a healthy subject (A. R. Short [6], Muskens [4], and Frew [1]), and the sequence of events classed under the name of delayed chloroform poisoning is largely due to the acidosis. Obviously, therefore, the use of chloroform as an anæsthetic in cases of parturition in which the patient is known to be suffering from an acidosis is to be avoided, and a case is quoted below which gives an instance of its danger.

The occurrence of albuminuria in a pregnant woman is one of the signs of the presence of a pregnancy toxæmia, but neither the mere detection of the presence of albuminuria, nor the quantitative estimation of the albumin present is sufficient. If albumin is found the daily output of urea should be estimated, as this is an important indication of the manner in which metabolism is being carried on, but in addition the presence or absence of an acidosis should be ascertained.

A well-marked acidosis occurs in cases suffering from the vomiting of pregnancy (Whitridge Williams [7], Leith Murray [3]), in nearly all cases in which the vomiting is severe, and occasionally in cases in which the vomiting is only slight. Every case of vomiting, whether severe or not, calls for the application of tests to ascertain the presence or absence of an acidosis. In one case (No. 4) in which the vomiting could not be called severe a marked acidosis was present. In another case a patient was reported to be suffering from severe vomiting of pregnancy before her admission to hospital, and on account of this report the usual investigations for acidosis were carried out and its presence ascertained. Observation after admission showed that the vomiting was only slight, not more than once or twice daily. She did, however, suffer from profuse pyalism. Treatment directed to the reduction of the acidosis not only did so, but was accompanied by the disappearance of the pyalism. This rather suggests that pyalism may be one of the expressions of a pregnancy toxæmia, and the case is mentioned in the hope that other observers may be able to produce evidence either in support or contradiction of this suggestion. It should be stated that this case, in addition, presented a well-marked papillitis on examination of the fundus oculi.

Several cases have been investigated to ascertain whether acidosis occurs in the case of pregnant women showing no pathological symptoms, but with results entirely negative. Several other cases have also been investigated to ascertain whether acidosis occurs in cases of albuminuria due to a primary nephritis in the non-pregnant. The results here were also negative. In one case (No. 6) the patient was known to have suffered from a chronic nephritis and an acidosis was found.

There is no reason why a pregnancy toxæmia should not occur in addition to a pre-existing chronic nephritis.

It seems that from the facts mentioned above it may be inferred that acidosis occurring in a pregnant woman suffering from albuminuria indicates a pregnancy toxæmia, although to prove this conclusively the investigation of cases of albuminuria in pregnancy without acidosis is

necessary. So far this evidence is wanting, since all the cases of albuminuria investigated showed an acidosis. All, however, suffered from some well-marked symptoms which led them to seek advice.

One patient, who was admitted suffering from albuminuria with acidosis, responded to treatment to such an extent as to lead to the disappearance of the diacetic acid, and a rise of the daily urea output to near normal, with a similar fall in the ammonia nitrogen, but she was readmitted to hospital some weeks later with a recurrence of the previous conditions, and in spite of treatment actually did become eclamptic. But in the majority of cases treated eclampsia did not supervene, although the acidosis persisted until after delivery. In all of the cases the acidosis disappeared within a comparatively few hours after delivery, so that pregnancy is undoubtedly the determining factor in producing the toxæmia, and its cessation leads also to the cessation of the toxic symptoms.

In Leith Murray's paper it is suggested that the acidosis, in cases of pernicious vomiting, is due to the starvation produced by vomiting. (Starvation acidosis has been already referred to.) In some of the cases of albuminuria investigated, however, and in one case of the vomiting of pregnancy, the patients were receiving no food by the mouth whatever, but injections of glucose and saline solution *per rectum*. This treatment did not, however, materially affect the acidosis. In spite of this treatment being continued after delivery, and no food given by the mouth, the acidosis disappeared almost entirely, so that it would appear that the occurrence of acidosis is not wholly due to starvation in these cases.

In one case, a primigravida suffering from vomiting, which inasmuch as it was not of a severity to prevent her taking food, and, as a matter of fact, only came on just before meals, was found to have diacetic acid in the urine, and an increase of ammonia nitrogen, with diminished urea output. The acidosis, however, in this case was not severe, and the percentage of ammonia nitrogen (6) not high. It seems fair to infer that in this case the small amount of vomiting present did not lead to starvation, and that the occurrence of acidosis should be attributed to a slight pregnancy toxæmia.

DIAGNOSIS.

The extent of the acidosis in a case of vomiting should give some indication as to whether the cause of the vomiting is a toxæmia of

pregnancy or due to some accidental complication causing vomiting in a pregnant woman.

In albuminuria acidosis points to a pregnancy toxæmia rather than a primary nephritis.

USE OF CHLOROFORM.

The following instance shows the danger of administering chloroform to a patient with acidosis: A multipara suffered from vomiting of such severity as to necessitate the termination of pregnancy. This was done under chloroform, the presence or absence of acidosis not having been ascertained. Within forty-eight hours she became comatose and suppression of urine occurred. The coma was recovered from after an intravenous injection of sodium bicarbonate, but the patient died a week later from uræmia. Albuminuria had not been proved to be present at any period before the termination of pregnancy, and the fact that diacetic acid was present in the urine was not ascertained in sufficient time to prevent the administration of chloroform as the anæsthetic. In this case the cause of the coma seemed almost certainly to be the rise of the acidosis due to chloroform, which unfortunately was the anæsthetic used in emptying the uterus.

In one case in the table (No. 14) chloroform was given inadvertently in the absence of the resident obstetric officer. The acidosis rose markedly after this.

At the Bristol Royal Infirmary the disuse of chloroform as an anæsthetic has been followed by a marked improvement in the mortality rate of cases of eclampsia. It seems highly probable that many of the deaths which occurred in previous series when chloroform was used as an anæsthetic were due to coma as the result of the acidosis produced by chloroform.

At the Bristol Royal Infirmary chloroform is no longer used as an anæsthetic in any case of eclampsia or in any cases of pregnancy where acidosis is present. Cases of pregnancy toxæmia are treated by the administration of glucose and saline by the rectum. If looked upon as pre-eclamptic, the diet is limited absolutely to milk, and if the general symptoms present are at all severe, by restriction to water only. The cases of vomiting are also treated in the same way, food by the mouth being excluded, but in either case a marked rise in the acidosis is looked upon as an indication for more drastic treatment, such as emptying the uterus.

PROGNOSIS.

A marked rise of the ammonia nitrogen should be considered as an indication for the termination of the pregnancy in cases of severe vomiting and also in cases of albuminuria, provided that it cannot be accounted for in a way to be presently mentioned. In one case of *post-partum* eclampsia no diacetic acid was found, although there was a large disturbance of the urea ammonia nitrogen ratio.

TESTS AND METHODS OF ESTIMATION.

The first step is to test the urine for diacetic acid. This is a simple matter, merely needing the addition to 3 c.c. of urine of a few drops of liquid ferri perchlor., when a deep red colour, which disappears on heating, is positive evidence of its presence. The tests for acetone and β -oxybutyric acid are not essential, since the presence of these substances is almost a necessary corollary of the presence of diacetic acid. If diacetic acid is found the urea ammonia nitrogen ratio should be worked out.

The following are the methods of estimation: The total urea excretion is found by the hypobromite method. The total excretion in grains *per diem* multiplied by 0.0303 gives the number of grammes of nitrogen passed as urea. To find the nitrogen passed as ammonia 25 c.c. of urine are shaken up with about 2 dr. of solution of potassium oxalate (strength 15 gr. to the ounce) to clear the urine and precipitate calcium salts. The solution is neutralized; 10 c.c. of 40 per cent. formalin are neutralized. These two are shaken together. The formalin combines with the ammonia bases of the diacetic and β -oxybutyric acid salts, forming urotropine, and the acids are set free in solution. The solution is then titrated against a decinormal solution of caustic soda; then, the number or cubic centimetres of caustic soda multiplied by the ounces of urine passed in twenty-four hours, multiplied by 0.0016, gives the grammes of ammonia nitrogen, and from this the percentage of ammonia nitrogen in the urea nitrogen and the ammonia nitrogen combined can be easily worked out.

SOURCES OF ERROR.

One patient developed an attack of cystitis with ammoniacal urine and enormous apparent increase of ammonia nitrogen. It is unnecessary to do more than indicate this complication as a possible source of error.

Also if the analysis is made from a twenty-four hours' specimen a certain amount of decomposition of the urea may have occurred in the course of twenty-four hours. In a comparison between the *pre-* and *post-partum* conditions this error would be common to both.

The conclusions to be drawn may be briefly recited as follows:—

(1) Administration of chloroform to a patient with acidosis should be avoided and chloroform should not be used for patients suffering from eclampsia.

(2) An increasing acidosis should be looked upon as an additional indication for terminating pregnancy in cases either of albuminuria or severe vomiting.

(3) To the ordinary treatment of these conditions should be added measures directed to the correction of the acidosis.

With reference to the table of cases, many of the investigations are incomplete owing to the difficulty in obtaining an uncontaminated twenty-four hours' specimen in every case. In each case in which the uterus was emptied, either naturally or artificially, that occurrence is indicated by **partus**. The occurrence of convulsions is also indicated by **fits**.

VOMITING.

No.	Name, &c.	Urine, oz.	Albumin	Diacetic acid or acetone	Grains urea per diem	Percentage of ammonia nitrogen		
1	L. C., I-para	32	O	+	+	230	17	} Water only Saline and glucose Milk; discharged normal
		36	...	...	...	310	13
		42	...	...	...	200	6
		18	...	...	...	220	4
		20	...	...	...	...	2.3
2	F. P., I-para	...	O	++	++	?	...	Ammonia nitrogen could not be worked out on account of diarrhoea; diacetic acid disappeared within forty-eight hours of emptying uterus
3	A. M., II para	...	O	++	...	?	?	Uterus emptied under CHCl ₃ (twins); coma forty-eight hours later; intravenous injection of sod. carb.; uremia and death eight days later
4	— R., I-para	...	O	+	+	342	6	Vomiting not sufficient to prevent taking food, and only occurred about two to three hours after meals; glucose per rectum

ECLAMPSIA

No.	Name, &c.	Urine, oz.	Albu- min	Diabetic acid or acetone	Grains ures per diem	Percentage of ammonia nitrogen	
12	E. C., aged 20, I-para	13 30 43	+++	+	308 ... 334	4.74	On admission, June 13, 1909 Ninth day
13	R. M., aged 19, I-para	? 91 63 99 71	++ + ... ... ...	... ... ... ...	540 400 606 466	 ... 12.9 13.7 13.5	June 29, 1909, CHCl ₃ given June 30, 1909 July 1, 1909 July 2, 1909 July 3, 1909
14	M.A.H.	? 12 46 70 51 50 60 50 30 19 40 52	+ ... ... ... ... ... ... ... ... ... ... ...	... ... ... ... ... ... ... ... ... ... ...	105 200 240 210 110 170 110 160 190 220	5 10 Two fits 13 ... 14 Partus 4 2.5 3.5	CHCl ₃ given by mistake Saline only <

Nos. 17 to 22 ... Normal pregnancy ... No acidosis
 Nos. 23 to 30 ... Albuminuria in the non-pregnant ... "

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- [4] MUSKENS, A. L. M. *Proc. Roy. Soc. Med.*, 1912, v (Anæsth. Sect.), p. 49.
- [5] SHORT, A. R. "The New Physiology in Surgical and General Practice," 1912, chap. viii, pp. 132-50.
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DISCUSSION.

Dr. EARDLEY HOLLAND did not propose to deal with Dr. Swayne's methods, but wished to congratulate him on his efforts to discover a method of finding out whether a case of toxæmic albuminuria was improving under treatment, or was progressing towards eclampsia. That a reliable method was highly desirable was obvious, and it was no less obvious that at present we possessed no method by which we were able to anticipate eclampsia in such cases. The method commonly used was that of estimating daily the amounts of urine, urea, and albumin. The unreliability of this method had been recently demonstrated to Dr. Holland in two cases of toxæmic albuminuria under his care at the City of London Lying-in Hospital. In both, daily observations showed the urine and urea to be increasing, and the albumin to be decreasing, in quantity; consequently, pregnancy was allowed to continue under the usual "anti-toxæmic" treatment. Nevertheless, both these patients got eclampsia, one with a fatal result. So much was Dr. Holland impressed with these two cases that, failing the discovery of more reliable methods of prognosis, it would be his practice in future always to induce labour in cases of toxæmic albuminuria of whatever severity. He looked forward to putting Dr. Swayne's method to the test at the first opportunity. He noticed that one of Dr. Swayne's cases of toxæmic albuminuria had been allowed to terminate in eclampsia, in spite of the prognostic advantages claimed for his method of estimating the degree of acidosis.

Dr. WALTER SWAYNE said that with reference to the case which was admitted with symptoms, and found to have albuminuria with acidosis, which some weeks later developed eclampsia, it was necessary to discharge the patient for want of room, and she was lost sight of in the interval. He was of opinion that had she been kept in hospital under treatment in all probability the convulsions would not have occurred. He considered that the presence of acidosis would be found to be a valuable means of distinguishing between cases of pre-eclampsia and cases of albuminuria due to primary kidney disease. He was of opinion that the presence of acidosis pointed to a pregnancy toxæmia, and its absence to the fact that that complication might be excluded.

Obstetrical and Gynaecological Section.

June 6, 1912.

Dr. AMAND ROUTH, President of the Section, in the Chair.

Hysterectomy for Polypoid Endometritis.

By C. E. PURSLOW, M.D.

THE specimen had been removed by abdominal panhysterectomy from a married woman, aged 33, who was admitted to the Queen's Hospital, Birmingham, on February 8, 1912, with the following history: She had been pregnant twice, the first time nine years ago, when she miscarried at five and a half months, and the second time six years ago, when abortion occurred at four and a half months. Since the first abortion she had never been free from blood-loss for more than ten days at a time, except after operation as mentioned later, and in the intervals of bleeding there had been a "mattery" discharge. In September, 1906, she was operated on at St. Mary's Hospital by Dr. Gow, and in March, 1909, at University College Hospital, by Professor Spencer. On each occasion polypi were removed and the uterus curetted. After each of these operations she was free from bleeding and discharge for three months. For one year before admission she had complained of abdominal pain—worse on exertion.

On examination, the uterus was found to be slightly enlarged, and some small soft polypi were protruding from the cervix.

Pathological appearances: The uterus shows some thickening of its walls, and numerous small soft polypi projecting into its cavity. The cervix is thickened, and in its muscular wall two cystic cavities are exposed, each having a diameter of $\frac{1}{4}$ in.

Microscopically the polypoid projections are seen to consist of glandular tissue, which does not invade the subjacent muscular wall.

Gravid Uterus with Fibroids.

By C. E. PURSLOW, M.D.

THIS specimen had been removed by abdominal supravaginal hysterectomy from a married multipara, aged 32. The last menstruation occurred four months before admission, and she had been in pain ever since then; the pain had been getting more severe, and during the



Gravid uterus with multiple fibroids; the largest tumour showing well-marked cystic degeneration. +, site of internal os.

fortnight before admission, on February 3, 1912, it had been so great that she was compelled to lie in bed. There had also been slight pyrexia and rapid pulse.

On examination: On the right side of the abdomen, and reaching to the ribs, there was a hard, tender tumour; on the left, and lower down, was an ill-defined soft mass which was diagnosed as the gravid uterus. Several other small hard masses could be felt on bimanual examination. Pregnancy with multiple fibroids was diagnosed, and the symptoms were thought to indicate red degeneration of the larger tumour.

Pathological appearances: The uterus has been divided sagittally, and shows a gestation sac with foetus and several fibroids; the largest of these, which has a diameter of 7 in., presents a well-marked cavity in its centre (*vide* photograph). There is no sign of red degeneration.

The microscopical report states that there are extensive degenerative changes of a simple character, but no sarcomatous developments anywhere.

The patient made an uninterrupted recovery from the operation, and remains in good health.

DISCUSSION.

Dr. HERBERT SPENCER asked whether it would not have been possible to let this patient go to term and perform Cæsarean hysterectomy, or to perform myomectomy instead of hysterectomy. His experience showed that pain in these tumours during pregnancy, which might, or might not, be associated with degeneration, usually subsided; in one case in which it continued there was no red degeneration, and the patient was able to go to term and be delivered of a living child by Cæsarean hysterectomy. This case, and others similarly treated, he had brought before the Section. In that of a patient now leaving his ward with her child, delivered three weeks ago, he had at the third month removed a sessile subperitoneal myoma of the size of an orange, which had undergone red degeneration and had lymph upon it, although the tumour was sterile; the subsequent labour was normal. In general he was opposed to hysterectomy during early pregnancy, and also to myomectomy, except in large or pedunculated, or twisted, or inflamed tumours. He had no evidence as to the position of the tumours with regard to the placenta as a determining factor in producing abortion after myomectomy, which he had only performed on one occasion during early pregnancy and once after abortion.

The PRESIDENT (Dr. Amand Routh) said he was always sorry to see a specimen of fibromyomatous uterus removed during early pregnancy. It was, as Dr. Herbert Spencer suggested, usually possible to delay operation till foetal viability, and then, or later, perform Cæsarean section. Had Dr. Purslow considered the possibility of performing myomectomy at the time of the operation?

Dr. TATE was of opinion that in the case described by Dr. Purslow a myomectomy might have been done with removal of the larger fibroid which was causing pain. He quite recognized the fact that in selecting this method of treatment the risk of the patient having to undergo further surgical treatment at some future time had to be faced, seeing that in this case other small fibroids were present which could not have been dealt with in this way. Dr. Tate was of opinion that in the interests of the child this was a proper course to recommend.

Dr. PURSLOW, in answer to the suggestion that the case might have been allowed to go on to full term, said that the patient was too severely ill for that to have been a wise course to adopt. As regarded the criticism that myomectomy might have been performed, he acknowledged the justice of it, but the area of attachment appeared to be too great to allow of this being done safely. On looking at the specimen it would be seen that the fibroid was attached over the centre of the placental site, and it seemed to him that any attempt at suturing the base, after removal of the tumour, would be certain to have interfered with the placental attachment and to have led to abortion, with perhaps dangerous hæmorrhage. He put forward the suggestion that the relation of the attachment of the tumour to the placental site might explain why in some cases abortion followed myomectomy, and in other similar ones no such result occurred.

Specimen of an Epignathus.

By CLIFFORD WHITE, F.R.C.S.

THIS specimen belongs to the variety known as sphenopagus, in that its chief point of attachment is to the base of the skull. The history of the specimen is as follows: The mother, aged 33, had had nine normal full-term labours and three miscarriages. She was admitted to the General Lying-in Hospital under Dr. Fairbairn, who kindly gave me the specimen for dissection. The child presented in the right occipito-anterior position of the vertex, and was born easily. Labour only lasted two hours and the tumour caused no obstruction to delivery. The heart beat for some minutes after birth and several ineffective efforts at respiration were made. The monster was a male, 18 in. long and weighing 4 lb. 6 oz. The placenta was pale and œdematous and weighed 20 oz., and measured 10 in. by 8½ in. Membranes normal. The tumour fills the mouth so as almost to dislocate the lower jaw. Before hardening it measured 5 in. long, 4 in. thick, and 3½ in. broad. It pushes the soft palate forward. Its base is attached to the base of the skull near the body of the sphenoid. It also has a smaller attachment to the upper surface of the hard palate. A process of the growth runs forward and projects as a polypus from the left nostril. The colour of the tumour varied from pink to black.

Sections were cut from various places as shown in fig. 2. Sections A, B, C, and E were covered by squamous epithelium and are formed of embryonic connective tissue containing spaces filled with blood, and

hair-follicles are present in places. B also contains groups of tubules lined by epithelium which may represent glands in process of development. Section D required decalcification; it shows cartilage, bone, teeth, and nerve. It is partly covered by squamous and partly by columnar epithelium.

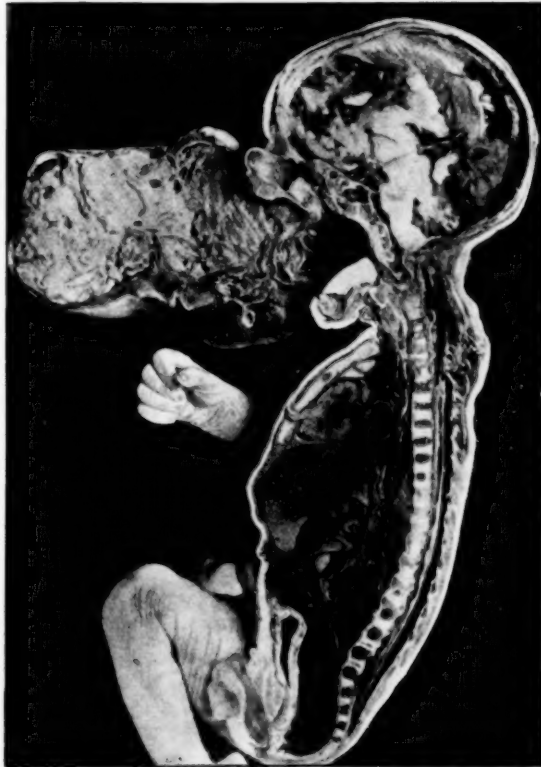


FIG. 1.

Right half of epignathus showing origin from base of skull. The section has been made just to the right of the middle line. The left half shows a portion of the tumour projecting through the anterior nares as a polypus.

The membranes being normal show that Ahlfeld's theory of an epignathus being an acardiacus amorphus which has been drawn into the buccal cavity of the autosite cannot apply to this case. The more

probable hypothesis is that it is a portion of the germ-plasm of the autosite which is separated off during early embryonic life, and which owes its position to the attachment of the ectoderm of the stomodæum, the apex of which forms the buccal portion of the pituitary body (Marchant-Bonnet). They are, therefore, comparable to the coccygeal teratomata which get an attachment to the neurenteric canal.

As a malformation they are rare. No case of epignathus or spheno-pagus is given in the index of the Obstetrical Society of London between 1859 and 1907.

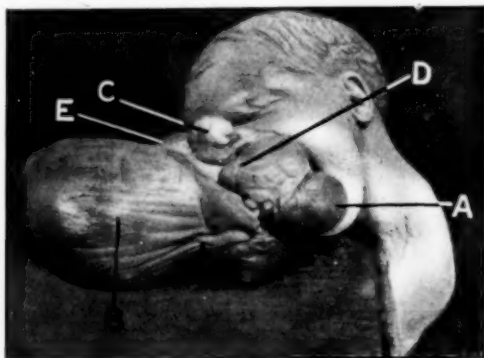


FIG. 2.

The letters indicate the places from which microscopical sections were taken.

Dr. BLACKER thought these cases were of great interest, not only because of the peculiarity of their structure and site of attachment, but also because of the complexity which surrounded their mode of origin. He supposed all would agree that Ahlfeld's original explanation no longer held good—namely, that an epignathus was due to the entrance of an acardiacus amorphus into the buccal cavity of its co-twin, and its secondary attachment in this region. This supposition appeared to be negatived by the fact that the autosite and parasite were always enclosed in the one amniotic cavity, and there was not, at any rate in most cases, that amount of deformity of the buccal cavity which might be expected if this explanation was the true one. Mr. White's specimen was especially interesting in this respect, because, although, as was not uncommon in these cases, a portion of the tumour protruded from the nose as a polypus, there had been no interference with the development of either the oral or nasal cavities. If a satisfactory explanation of these cases of "endoprosopus amorphus," as Taruffi terms them, was to be found, then, as Professor

Windle had pointed out, it must meet the case not only of such a tumour as the one shown by Mr. White, but also of the least marked degree of this condition in which there was present only a polypus covered with skin and attached to the pharynx. The suggestion that the tumour was in reality a second maldeveloped ovum appeared rather far-fetched when the condition was merely that of a polypus. It would appear more probable that the portion of germ-plasm from which these tumours took origin had never possessed the power of developing into a complete fœtus, but only of forming part of a fœtus, or at the most a dwarfed fœtus. This hypothesis received a good deal of confirmation from various experiments which had been carried out on the eggs of some of the lower animals. Experiments on the eggs of the sea-urchin had shown that when the blastomeres were separated by shaking, an isolated blastomere might go on developing and give rise to a dwarf animal only one-half or one-quarter the size of the adult. This experiment had even succeeded when the ovum had reached the stage of division into sixteen cells, and then the product was a dwarf only one-sixteenth the normal size. On the other hand, another series of experiments had shown that in the eggs of the ctenophores, if a part of the egg before segmentation was separated, the isolated portion gave rise not to a dwarfed animal but only to a part of the whole body, varying in size with that of the portion of the egg removed, and further that the part of the egg remaining in its turn gave rise to an imperfect animal showing certain defects corresponding to the part removed. Such experiments lent great support to the view that these tumours represented separated portions of the germ-plasm not necessarily capable of developing into a whole ovum or even into any large part of an ovum, but only into an imperfect portion of an ovum. If we accepted such an explanation then the site of implantation was readily explained by supposing that the separated portion of germ-plasm, at an early stage of development, found its way into the stomodæum, or was drawn in with the buccal invagination of the epiblast and acquired an attachment thereto. It was unfortunate that in Mr. White's specimen it appeared impossible to determine whether the cranio-pharyngeal canal was still present or not, because in those cases in which the stalk of the tumour penetrated the base of the skull this was usually the case. Dr. Blacker thought that a similar explanation would hold good in the case of many of the sacral teratomata which bore many resemblances to the epignathi. It was quite conceivable that in these tumours a separated portion of germ-plasm found its way into the neurenteric canal, and then developed in this situation, and that some, at any rate, of these tumours developed in this way rather than from the tissues around the canal. To the objection that if the parasite was due to the development of a separated portion of the segmenting ovum the autosite should show some signs of malformation, the reply would be that the portion of germ-plasm need not be derived from the ovum at all, but might come from a fertilized polar body, or, as Windle had suggested, possibly, from a spermatozoon.

Generalized Œdema of the Fœtus.

By CLIFFORD WHITE, F.R.C.S.

THE mother of the child was a woman, aged 33, who was admitted in labour to Dr. Herbert Spencer's wards at University College Hospital. She was thirty-two weeks pregnant and in fair general condition. Slight œdema of the feet was present and her nutrition was poor, but there was no gross œdema or anæmia. There was no history of hydramnios or other abnormality during pregnancy. The child was



"Snap-shot" of fœtus with generalized œdema and ascites, taken immediately after delivery.

lying with the face presenting and the chin in front. The heart sounds remained satisfactory till the second stage had lasted one hour, and then signs of foetal distress began to be shown, and so the face was delivered by forceps without difficulty. As there was delay with the shoulders a finger was inserted to make traction on the axilla, but the tissues were so friable that they tore in the supraclavicular fossa and a quantity of clear yellow fluid escaped from a hydrothorax and from the subcutaneous tissues. The child was then delivered by traction. It was universally œdematous and ascitic. The heart continued beating for several minutes and a few attempts at respiration were made. The child was a female, measuring $16\frac{1}{2}$ in. long and weighing 6 lb. The thoracic duct, kidneys, bladder, umbilical cord, and heart and liver were normal. The foetal blood was not examined. Free fluid was present in all the serous cavities, but the viscera themselves were not œdematous.

Sections of the subcutaneous tissues and muscles show the skin to be of normal thickness, the subcutaneous tissue is œdematous, lymphatics dilated, vessels normal. The muscle-fibres are healthy but separated by œdema from each other.

The placenta was much enlarged and weighed 3 lb. 9 oz. It looked pale and fibrous. It did not seem to be œdematous, and no obvious excess of fluid could be obtained on squeezing it. Sections show surprisingly little change. The villi are œdematous, but not markedly so, their cells stain well, and the villi are close to each other, so that, considering the increase in the size of the placenta it seems probable that there is a large increase in the number of the villi present.

Dr. Embleton made a thorough examination of the foetal tissues and exudate but failed to find the *Spirochæta pallida* anywhere. The mother's blood was negative to Wassermann's reaction.

The obstetric history given by the mother is unusual; she had had ten pregnancies. The first child, born seventeen years ago, is alive and well; one other lived two years, four ended in miscarriage, and the remainder were either stillborn or else died soon after birth from prematurity.

The ætiology of the condition is obscure, the causes usually suggested, such as maternal syphilis and blood states, abnormalities of the foetal heart, umbilical cord, kidneys and thoracic duct, can all be excluded. It is possible that it is a toxic œdema which allows increased exudation from the lymphatics, and the toxic state may depend on a failure of the placenta to excrete. The placenta, however, shows comparatively little microscopic change.

Dr. Russell Andrews in 1902¹ showed a specimen and gave the literature; he noted that twelve similar specimens had been shown to the Section. The present specimen is very similar to Dr. Russell Andrews's and also to the summary which Dr. Ballantyne gives of his seventy collected cases.

DISCUSSION.

Dr. TATE referred to a case that he had first seen in 1905. At that time the patient was aged 28. Her first child, born at full term, was quite healthy and lived for one and three-quarter years. After that two children were born dead at the seventh month suffering from generalized œdema. In 1907 the patient again had a premature labour at the seventh month, the child being born dead and suffering from general œdema. Throughout this pregnancy she was put on a course of iodide of potassium and mercury.

The patient had another child born dead at the seventh month, in October, 1910, but this child was quite free from any œdema. At the time of writing the patient is again six months pregnant.

Dr. H. R. ANDREWS said that Mr. Clifford White's case resembled one shown by him before the Obstetrical Society ten or twelve years ago. In Dr. Andrews's case the placenta was very large, and on naked-eye examination appeared to be œdematous, but microscopical examination did not show anything abnormal. Dr. Andrews had been unable to find anything that could be assigned as a cause for the condition.

Mr. CLIFFORD WHITE, in reply to Dr. Tate, said that in this case the greatest care had been taken to exclude syphilis by Dr. Embleton's careful research on the blood and viscera. He had no suggestions to offer regarding treatment, but did not think that antisyphilitic treatment was indicated.

Hæmatocele of the Canal of Nuck.

By J. A. CAIRNS FORSYTH, M.B.

THE specimen was removed from the right inguinal region of a woman, aged 43. It was first noticed fifteen years ago and was then



Hæmatocele of the canal of Nuck (exact size).

the size of a walnut. For thirteen years it remained stationary and then, without any apparent cause, rapidly increased to its present size. The swelling was considered to be a hydrocele of the canal of Nuck, but at the subsequent operation for its removal it proved to be a hæmatocele. Very probably the condition began as a hydrocele, and the rapid increase in size (two years ago) was due to hæmorrhage into the sac.

Two Cases of Dystocia due to Premature Contraction Ring of Uterus.

By J. A. WILLETT, M.D., and HERBERT WILLIAMSON, M.B.

CASE I (DR. WILLETT).

THE history of the case, which came under my own observation, is as follows: S. H., aged 42, a very stout woman and the mother of ten children, the last being born four years previously. Her last menstrual period ended during the first week of March, 1911. All her past labours had been uncomplicated and her pelvic measurements were above the average. She was admitted as an emergency case, into the City of London Lying-in Hospital on December 20, midnight (11.55 p.m.). Labour had started at 10 a.m. the same day with escape of the liquor amnii. On admission her pulse-rate was 84, and temperature 99° F. The uterine contractions were very infrequent and the os was about the size of half-a-crown. The child presented by the face in the second position. The foetal heart was not heard. As her condition was that of uterine inertia 20 gr. chloral hydrate were administered, after which she dozed and slept for some hours. During the morning of December 21 her condition remained much the same, the pains still being infrequent, and the os dilated slowly, not being fully dilated till midday. At 1 p.m. it was noticed that her pulse-rate was 116, and at 2.30, when I saw her, it had risen to 132 without any apparent reason, and with this exception the patient's condition was not urgent. The uterus was soft and not tender, nor were its contractions severe; no ring could be felt, though owing to the thickness of the patient's abdominal wall it might have been present and yet have escaped detection. I deemed it advisable to deliver the patient, and the forceps

was applied to the face under CHCl_3 . The head was easily brought down to the outlet, the chin rotated forwards, but the utmost difficulty was experienced in bringing the head over the perineum, and it was not until one blade of the forceps was used as a vectis that the head was completely delivered. The cause of the difficulty was now evident, as the shoulders of the child were detained above a thick ring which encircled the lower part of the neck. The child was dead and its skin stained by meconium.

To have performed an embryotomy would have been extremely difficult, and the results of this operation in previous cases had seemed to me to be unsatisfactory, so that I determined to try the effect of continuous weight traction before interfering further. To this end the head was perforated, a cranioclast screwed firmly home, and attached to its handle by a towel was a weight of approximately 8 lb. which hung over the foot-rail of the bed. (Estimated under as nearly as possible similar conditions the total pull on a spring balance was $6\frac{1}{4}$ lb.). A hypodermic injection of morphia $\frac{1}{2}$ gr. was given partly in the hope that it might aid in the relaxation of the spasm, but chiefly to keep the patient quiet. For three hours the patient slept and during this time there was a complete absence of uterine contractions. She then awoke, and a few slight pains rapidly delivered the child, which weighed 6 lb. 14 oz. minus the brain. The remaining liquor amnii escaped; it was stained with meconium and offensive. The placenta was born naturally twenty minutes later. A hot intra-uterine douche was given and it was then noticed that the obstructing ring had disappeared.

The patient, except for a mild attack of sapræmia, did well and left hospital on the fourteenth day. She could give no information as to how long the child had been dead, in fact she was under the erroneous impression that it was alive when she entered the hospital.

I recognize that this was an ideal case in which to try the effect of continuous weight traction, since the child being dead and the mother's condition not really urgent, there was no necessity for rapid delivery. In addition, the longitudinal lie of the child and the fact that the uterine spasm was localized were both very favourable factors.

The rarity of dystocia due to a contraction ring and the difficulty of its treatment has led me to bring this case before the notice of the Section.

CASE II (DR. WILLIAMSON).

C. W., AGED 40, had six previous labours and on two occasions had borne twins. Her seventh pregnancy ran a normal course and labour commenced at 10 p.m. on January 15, 1912. The diagnosis of twin pregnancy was made; both children presented by the vertex and the first child was delivered spontaneously at 4 a.m. on January 16. During delivery the umbilical cord ruptured at a point 4 in. from the placenta; the maternal end was not tied but no hæmorrhage ensued. The membranes of the second sac ruptured spontaneously at 1 p.m., and as the head of the second child did not descend into the pelvis the extern midwifery assistant was summoned. On examination he found the head, both feet and the cord presenting. Pulsation was felt in the cord. The patient was anæsthetized and the whole hand introduced into the vagina. The head lay at the pelvic brim in the fourth position of the vertex and was badly flexed; on either side of it was felt a foot, and in front of it a loop of the umbilical cord. Attempts were made first to replace the legs; secondly, to push up the loop of cord; thirdly, to apply forceps. None of these succeeded, for the head and legs were firmly fixed. The patient was then brought into the lying-in ward of St. Bartholomew's Hospital. I saw her at 4.15 p.m. and dictated the following note: "The patient does not appear anxious or distressed, the tongue is furred but moist, the pulse 110, and the temperature 98.4° F. The uterus rises to within 2 in. of the costal margin; a ring of contraction can be seen and felt running almost transversely across it midway between the pubes and umbilicus. The portion of the uterus above the ring contracts with the pains and relaxes in the intervals; the ring remains in a state of tonic contraction and cannot be felt to relax at all; the portion of the uterus below the ring remains flaccid, but hardens a little with the contraction. The head is below the ring, the shoulders are above it. *Per vaginam*: There is marked œdema of the vulva, vaginal walls and portion of the uterus below the contraction ring. The head lies in the third position of the vertex with the occiput opposite the right sacro-iliac synchondrosis and is imperfectly flexed. A foot is felt on either side of the head and a loop of the umbilical cord lies between the forehead and the symphysis pubis. The contraction ring feels like a tight muscular band round the child's neck, it extends round the whole circumference of the uterus, the head and both feet are below it, the shoulders and trunk above."

The patient was deeply anæsthetized, the bladder emptied, and a hot vaginal douche given. With considerable difficulty I succeeded in pushing up the loop of the cord (which was still freely pulsating) and both feet above the ring, but attempts to dilate the ring with the fingers failed. It was clear that efforts to perform internal version would result in rupture of the uterus, but I thought that the spasm might be overcome by steady traction. I therefore applied forceps to the head and kept up gentle traction on the handles, taking care to use very little force. In about fifteen minutes the ring appeared to yield, the head descended with the face anterior, and the child was easily delivered.

The birth of the child was followed by some bleeding; the loss was not rapid, but as it persisted the placenta was expressed; the uterus then contracted well but the bleeding continued. I therefore passed my hand into the vagina and discovered a tear involving the vaginal vault, the cervix and the lower uterine segment on the right side; the hand could be passed between the two layers of the broad ligament but not into the peritoneal cavity. There was, therefore, an incomplete rupture of the uterus. I pressed the two edges of the tear firmly together and kept them approximated by means of a volsellum forceps. This completely arrested the hæmorrhage. By drawing the forceps over strongly to the opposite side I was able to bring the wound into view sufficiently to sew up the rent in the uterine wall with catgut sutures. I next gave an intra-uterine douche, and then passing the nozzle up into the broad ligament through the opening in the vaginal vault, irrigated the cavity between the two layers and passed in a gauze drain, leaving the end in the vagina. The plugging in the broad ligament was removed in twenty-four hours.

On the day following the operation the patient's temperature reached 103° F., but in the course of a few days it fell to normal and she made a good recovery, leaving the hospital a fortnight after delivery. The child was born in a condition of white asphyxia and we were not able to resuscitate it.

This case is an instance of what has been aptly described by Dr. Eardley Holland as "active retention of the fœtus by the uterus."¹ A ring of muscular contraction situated at the junction of the upper and lower uterine segments gripped the fœtus so firmly as to prevent delivery. A contraction ring of this kind must not be confounded with

¹ *Journ. Obstet. and Gyn. Brit. Emp.*, 1911, xix, p. 528.

the condition described by Bandl in which, as the result of some abnormality of the pelvis, or child, or some error of position of the fœtus, the uterus passes into a condition of tonic contraction with retraction of the whole upper segment. Here there was neither tonic contraction nor marked retraction of the upper segment, but a spasm confined to a narrow zone of the uterine musculature and strictly analogous to the zone of spasm found in the condition of hour-glass contraction occasionally seen in the third stage of labour.

Two questions require consideration: (1) How is the spasm caused? (2) How may it be overcome? I believe that in the majority of cases it arises in response to some mechanical irritation of the uterine wall. Such antecedents have been present in most of the recorded cases and was undoubtedly present in the case I have just described. With regard to the second question, it is clear that neither chloroform nor morphia, nor even a combination of the two, can be relied upon to relax the spasm. Atropine might be of value, but as far as I am aware it has not been tried: I intend to try it when I meet with another case. Cæsarean section does not always offer a satisfactory solution, for in two cases of Dr. John Phillips's recorded by Dr. Holland, great difficulty was experienced in extracting the child after the uterus had been opened. Division of the contraction ring and extraction of the child *per vaginam* would, as pointed out by Jardine, almost inevitably lead to rupture of the uterus. Finally, as my own case shows, the method of steady traction is not devoid of risk, though possibly had I employed the method practised by Dr. Willett, rupture of the uterus might have been prevented.

DISCUSSION.

Dr. EARDLEY HOLLAND said that these two cases were good examples of a variety of uterine dystocia, the importance of which obstetricians had been slow to recognize. The obstruction to the passage of the fœtus was due to the activity of the uterus and to no other cause, and therefore, in a report on somewhat similar cases which he himself had recently made, he had proposed the term "active retention of the fœtus by the uterus." The first communication bearing on this variety of dystocia was, so far as he recollected, one made to this Section in 1909 by Russell Andrews and Maxwell; subsequently, two other papers, by Jardine and himself respectively, appeared in the *Journal of Obstetrics and Gynæcology* for 1911.¹ In each of the two cases now under discussion the obstructing ring was clearly due to a ring of local tonic

¹ *Journ. Obstet. and Gyn. Brit. Emp.*, 1911, xix. p. 526; xx, pp. 11-17.

contraction at the region of the os internum; it was therefore a "contraction" and not a "retraction" ring. He noted that Dr. Williamson had used the correct term, but that Dr. Willett had used the term "retraction" ring, which, in Dr. Holland's opinion, was wrong. Obstruction could, of course, be caused by either variety of ring, but careful distinction should be made between them. In the series of cases reported by Jardine he had noticed that the two had been considerably confused. In the third stage of labour local contraction rings had long been recognized as causing the so-called "hour-glass contraction" of the uterus, but their occurrence in the first and second stages as a causative factor in obstructed labour had received scant attention. One had only to refer to the text-books of midwifery to satisfy oneself on this point, and in the most deservedly popular text-book of the present day the subject of partial tonic contraction—i.e., local contraction rings—was discussed as being "unimportant." That it was, on the contrary, highly important was evident to anyone who had just listened to the account of these two cases and who had read the account of the case published by Dr. Jardine. The condition was a serious one for both mother and child; a correct diagnosis was essential and the treatment was difficult. Dr. Holland thought that differentiation between contraction and retraction rings would usually be simple. In the case of a retraction ring the lower uterine segment would be elongated and thinned, for retraction being a purely compensatory process, could only occur at the expense of elongation of the lower segment; on abdominal palpation, the differentiation between upper and lower segments would be evident and the ring would be felt. In the case of a contraction ring, on the other hand, the lower segment would not be altered, and the ring would not easily be felt on abdominal palpation; on this latter point, however, he was not clear, and he would particularly like to know if Dr. Williamson and Dr. Willett had felt the ring on abdominal palpation in their cases. Further, the indications for treatment were different: a retraction ring was almost invariably the result of obstruction elsewhere, the uterus was in danger, the condition was urgent and demanded prompt treatment in order to save the uterus. A contraction ring, on the other hand, was the cause of the obstruction; indications for treatment were not so urgent, as the uterus was in no danger. He would like to congratulate Dr. Willett on his ingenious and successful method of treatment by continuous weight traction. He felt that Dr. Willett had taught him, and he believed also other members of the Section, a valuable lesson in obstetrics. In cases where the condition of the mother and child did not call for immediate interference, Dr. Holland would give opium and chloroform a trial. If the patient could by these means be got to sleep, he believed the spasm would pass off.

Dr. H. R. ANDREWS said that he was very much interested in Dr. Willett's account of his ingenious method of effecting delivery by continuous traction. In the case described by Dr. Maxwell and Dr. Andrews some years ago, this method could not have been used, as the fœtus was so much decomposed that

any part of it that was pulled on became detached. The difficulty of delivery in that case was due to the presence of a retraction ring, not a contraction ring, such as those described by Dr. Williamson and Dr. Eardley Holland.

Dr. HERBERT SPENCER thought that Dr. Williamson's suggestion of local irritation might possibly also explain the rigidity of the cervix after a certain amount of dilatation in cases of placenta prævia. This rigidity, it was well known, yielded in the course of a few hours to the gentle continuous pressure of the soft cone formed by the lower limb and trunk of the child after podalic version, even without any traction. Had it occurred to Dr. Willett to remove the projection of the shoulders and so convert the trunk from the neck upward into a soft cone by cutting through the clavicles, a method recommended by the speaker seventeen years ago for the delivery of cases of impacted trunk? Had this been done it was probable that the delivery by Dr. Willett's ingenious method of continuous traction would have been facilitated.

Mr. TARGETT agreed with the author's explanation that the contraction ring was probably due to external and local irritation of the muscular wall. He referred to a case of uterine inertia with a very stout and flabby abdomen where a contraction ring seemed to have been set up by injudicious application of pressure upon the abdomen either by the hand or by a tight binder. In that instance it was possible to dilate the contraction ring with the hand introduced into the uterus under deep anaesthesia after the manner in which an "hour-glass contraction" of the uterus was treated in the third stage of labour. He thought there was no difficulty in distinguishing this form of local contraction from the much more serious retraction ring of Bandl.

The Physiological Influence of Ovarian Secretion.

By A. LOUISE McILROY, M.D.

PART I.

- (1) Introduction.
- (2) Constituents of the ovary and their relationship to menstruation, ovulation, pregnancy and lactation.
- (3) Effect of suppression of ovarian secretion before and after sexual maturity.
- (4) Effect of ovarian secretion derived from transplanted ovarian tissue and from administration of ovarian extracts.
- (5) Effect of (a) withdrawal of uterine secretion and (b) its retention.
- (6) Effect of ovarian secretion upon metabolism.
- (7) Correlation of the ovary with other ductless glands.

PART II.

Details of experiments.

Conclusions.

PART I.

(1) INTRODUCTION.

OUR knowledge of gynæcological pathology is extensive, but there is much need for research in regard to the physiological changes which occur in connexion with reproduction in the female. From investigations of the phenomena which take place as a response to ovarian secretion we have been led to the belief that the ovary is not an organ with the single rôle of reproduction, but is an essential factor in the maintenance of the equilibrium which exists between the so-called ductless glands or endo-secretory organs. Researches into ovarian function now tend to show that the removal of ovaries for slight pathological affections, or for the alleviation of menstrual derangements, is against the best ultimate interests of the patient, and that total extirpation of the ovaries should not be practised unless these organs are the seat of some severe pathological lesion. That the ovary has a marked physiological effect upon the organism as a whole is evidenced by the skeletal and pelvic changes which take place at sexual maturity in the normal

individual. The psychological and secondary sexual characters are only manifest when the ovary becomes invested with functional activity. The changes in the ovary are indicated by the onset of menstruation. Again, the effects of withdrawal of ovarian secretion are to be observed at the menopause, whether occurring naturally or artificially produced. The changes in the organism are found to take place in relation to the nervous system and general metabolism. Further justification for the classification of the ovary as a ductless gland is to be found in experiments wherein the ovary has been removed and successfully implanted in a site where it is independent of its nervous attachments. The outlet for the secretion in the implanted ovarian tissue can only be the blood- or lymph-stream. What the nature of this ovarian secretion is has not been discovered, and no specific substance has been isolated. That the ovary has a dual function or secretion is most probable, when an analogy is made with the other ductless glands. But whether these two secretions act in combination with or are antagonistic to one another is still a mystery, and further work is necessary in order to throw light upon the chemical nature of ovarian secretion.

(2) CONSTITUENTS OF THE OVARY.

In a paper published in 1910 I endeavoured to show that in mammals all the epithelial elements of the ovary have a common origin in the oögonia or primitive germ cells. From the oögonia are derived the Graafian follicles with their oöcytes and follicle cells, and also the interstitial cells scattered throughout the stroma of the ovary. The so-called connective tissue or stroma is merely structural and vascular in its function, as has been found in other ductless glands, and takes no part in the elaboration of an internal secretion. It follows, therefore, that all the cells of the ovary employed in the elaboration of an internal secretion have a common origin. The problem awaiting solution is, which part of the ovary is most concerned in the production of an internal secretion? Do the follicles and interstitial cells combine and take part in the maintenance of the nutrition of the uterus and other reproductive organs, or do they act separately or even antagonistically to each other? We have also to consider the further development of the follicles into corpora lutea and the chemical action of the latter upon the organism as a whole. In the ovary, unlike other glands such as the adrenals, there is no sharp demarcation between the cortical and medullary portions. During the process of follicular development there is a continual passage

of cells from the centre towards the periphery, although on the whole follicles are much more numerous in the cortex than in any other portion of the organ. The follicles in the human ovary are found to be numerous even before birth, and the conclusion to be drawn from this is that there must be some element other than the mere presence of follicles to account for the incidence of ovarian activity at puberty. The changes observed in the ovary at puberty are the production of corpora lutea, which are closely associated with the phenomena of menstruation or pro-œstrum, as well as with pregnancy.

The *corpus luteum* is formed, according to Heape, by the ingrowth of cells surrounding the follicles, together with follicular epithelium. Although many authors (Clark, Wendeler) still adhere to the stroma origin of the lutein cells, it is now generally accepted that these cells are derived from cells which have a common origin in the oögonia. Sobotta, after the examination of ovaries at known stages of corpus luteum development, states that the lutein cells are the hypertrophied epithelial cells of the undischarged follicle, the stroma forming merely an intercellular supporting network. This view has been confirmed in the main by Marshall upon sheep, and Cohn upon rabbits. The granulosa cells become enlarged after the rupture of the follicle and extrusion of the oöcyte, and are said to be cast off into the cavity of the corpus luteum. This body is much more conspicuous after fertilization has taken place, forming a true corpus luteum of pregnancy as compared with the false corpus luteum of œstrus or post-menstruation. The corpus luteum is supposed by some to preserve the cortical circulation of the ovary, and to prevent the formation of excessive scar tissue, but it is much more probable that the interstitial cells have most influence in the preservation of ovarian tissue nutrition. Bouin and Ancel found the yellow pigment in the lutein cells to be of the nature of a lipoid.

The *interstitial cells* are distinguished from the stroma cells by their larger size and more oval nuclei. That they take part in the formation of ovarian secretion is shown by their increase in size during pregnancy in the rabbit (Lane-Clayton). They increase in size during the breeding season in rabbits, and are decreased during the anœstrous period, or in isolation from the males (Regaud and Dubreuil). Interstitial cells in the testes have been found to have a common origin with the sperm cells (Gemmell). Whether the interstitial cells act in conjunction with or are antagonistic to the follicle and corpus luteum cells is unknown. It is probable that they modify the growth of the organism and give rise to an internal secretion. This ovarian secretion is called by Heape "gonadin."

Menstruation and Ovulation.

Ovarian activity is evidenced in the human female by the onset of menstruation, and by the pro-œstrum in the lower mammals, and is the sign of sexual maturity. The changes which occur in the uterus during the reproductive life of the individual are cyclic in character. There is a resting or anœstrous period which is followed by congestion of the pelvic organs, accompanied by the hæmorrhagic discharge known as pro-œstrum or menstruation. Œstrus takes place subsequently, and marks the period when fertilization is most likely to take place. The period of recurrence of these cyclic changes varies according to the species of animal. They are influenced by seasonal and nutritional changes, and as a rule do not occur during pregnancy. In the menstrual or pro-œstrous period there is a thickening of the uterine and tubal mucosa, with increased secretion of mucus. Hæmorrhagic discharge occurs in most mammals. During the post-menstrual period or œstrus there is a proliferation of the cells of the uterine mucosa, and it is said that an exfoliation occurs. If fertilization does not take place the pelvic organs gradually return to their original condition of physiological quiescence. This hæmorrhagic discharge differs from ordinary systemic blood in its non-coagulable properties, but it has not been definitely proved as yet what substance causes this property; whether due to the presence of a hormone or excreted ferment is still unknown. That menstruation and pro-œstrum depend upon ovarian secretion is proved by the cessation of this phenomenon at the menopause, or on removal of both ovaries, and by its continuance or recurrence when the ovaries are transplanted elsewhere. Marshall and Jolly experimented with injections of ovarian extracts and grafted ovaries from œstrous dogs into others in the anœstrous state, and found that transient signs of heat occurred. Clinically it is frequently found that ovarian tumours, by their destruction of the normal tissue of the ovary, cause amenorrhœa. During pro-œstrum certain follicles of the ovary mature and the ova are extruded, but there is no direct evidence as to when ovulation takes place in the human female. In some rodents ovulation takes place during or just after œstrus, spontaneously or at the time of coitus. Heape, Regaud and Dubreuil maintain that in the rabbit there is no ovulation without coitus. Frank states that as the result of experimental removal of the uterus several days after parturition in isolated rats and guinea-pigs spontaneous ovulation does occur, as evidenced by the presence of deciduomata in the uterus and corpora

lutea in the ovary. Bouin and Ancel are of opinion that in certain species of mammals ovulation takes place after coitus. Loeb, in a series of experiments upon guinea-pigs, found that ovulation occurred spontaneously. The theory that the presence of a corpus luteum exercises an inhibitory effect upon subsequent ovulation receives support from the fact that ovulation as a rule does not occur during pregnancy, although cases of superfoetation have occurred in the human female and in rodents. Additional evidence for the theory is to be found in the practice common among breeders of cattle, namely, the manual expression of persistent corpora lutea by means of fingers introduced into the rectum in the case of cows which have failed to come into season. This manipulative process is usually followed by the onset of "heat," showing that ovulation has occurred.

Although ovulation probably occurs at the beginning of the œstrus period there is no doubt that the changes which take place in the follicle and which cause its transformation into a corpus luteum begin at a period prior to the onset of the congestive condition of the uterus. These changes are doubtless due to some chemical substance secreted by the ovary, seeing that they stop immediately on removal of both ovaries during the pro-œstrum in animals. The absence of ovulation due to the persistence of a corpus luteum in the human female may explain cases of sterility which are successfully treated by the removal of a portion or whole of one ovary. In one case which came under my care for primary sterility, and in which both ovaries were slightly enlarged, one ovary was removed, and the patient became pregnant within a few months of operation. This ovary on histological examination showed small cystic dilatation of some of the follicles but no marked pathological lesion was found. In cases of small hæmorrhagic cysts of the ovary—a condition analogous to a corpus luteum exaggeration—it is often observed that menstruation is irregular, with more or less prolonged periods of amenorrhœa. Manipulation of the ovaries by bimanual examination, or at time of operations upon the pelvic organs, is sometimes followed by uterine hæmorrhages a few days later, almost simulating a menstrual period in some cases. It is just possible that an explanation of such a condition may be found in the rupture of a follicle and the secretion of an ovarian substance into the bloodstream bringing about a congestion of the uterus. Ovulation may occur independently of menstruation, as is shown by cases of pregnancy occurring in women who have never menstruated, and cyclic menstrual molimina in cases of normal ovaries with rudimentary uterus.

Effect of Ovary upon Pregnancy.

The ovary, as a rule, is quiescent during pregnancy as far as cyclic changes are concerned, although histological evidence points to the fact that there is considerable physiological activity present in the corpus luteum and interstitial cells, both tissues showing enlargement of their cells. Fraenkel's experiments on removal of corpora lutea in pregnant rabbits followed by abortion prove that the corpus luteum has a trophic influence upon the nutrition of the ovum, in the early stages of pregnancy at least. Marshall and Jolly found similar results in dogs and rats. Loeb removed the corpora lutea in the latter part of pregnancy and found that they were regenerated. That the foetal tissues have an inhibitory effect upon the ovary has not been satisfactorily proved. Frank placed emulsions of foetal tissues in the abdominal cavity of rodents, and in others administered injections of foetal tissue extracts, without any effect upon the ovaries. Loeb carried out a series of experiments upon recently fertilized rabbits and guinea-pigs by mechanical irritation of the endometrium and produced decidual nodules in the uterus. If the corpora lutea were removed or cauterized prior to the experiment no decidual reaction occurred, which showed the influence of the corpus luteum on decidual formation. Clinically, there is a marked correlation between the corpus luteum and decidual tissue in cases of syncytioma in which lutein cysts are frequently found in the ovary. It is supposed that the corpus luteum itself acts as a ductless gland, producing a specific internal secretion, which influences metabolism and maintains the nutrition of the ovum in the uterus. If fertilization does not take place the corpus luteum degenerates and a scar remains. In cases of repeated abortion in which other causes can be excluded, it may be supposed that there is some ovarian insufficiency. Why is it that premature expulsion of the ovum is so much more frequent in the early months of pregnancy before full placental development has taken place? May not there be some suppression of the nutritional or trophic influence of the corpus luteum? The investigation of such cases should prove of physiological interest. It has been found impossible to produce abortion by the application of X-rays (Kelen), and as these rays cause atrophy of the Graafian follicles it may point to the interstitial cells as having a trophic influence upon the ovum.

Lactation.

Foges found that the mammary gland remained infantile if castration was performed before puberty. Ribbert found secretion of milk during pregnancy in a transplanted mammary gland, showing that its vascular or nervous connexions were not necessary for its function. At puberty the mammæ enlarge, and they become atrophic after the menopause has taken place. Swelling of the mammæ, with sometimes painful sensations, are observed during menstruation. That milk production is not solely due to pregnancy—to a hormone secreted by the foetal tissues (Lane-Clayton and Starling)—is proved by cases of virgin animals suckling young animals (Marshall), and by the fact that in the human individual lactation has been induced in children and in males. Watson has shown in rats that the corpus luteum in pregnancy persists during lactation. That lactation is independent of ovarian influence in some cases is shown by Maniger, who records a case of lactation after full-term pregnancy in a woman who had been the subject of double oöphorectomy. The causation of lactation is still unknown, but it is probable that the ovary is the dominating organ in its production, together with the other ductless glands.

(3) EFFECT OF SUPPRESSION OF OVARIAN SECRETION BEFORE AND AFTER SEXUAL MATURITY.

Before Sexual Maturity.

Although no definite records can be found in the literature of the effects of oöphorectomy in children before puberty, it is generally assumed that this operation prevents the onset of puberty and the occurrence of menstruation. Marshall suggests that the female would take on the male type of character were it not that the ovary inhibits the development of the secondary male characters which are normally latent in the female. Biedl discusses this question of the effects of castration before puberty. In the male it causes increase in the long bones, and it is probable that similar results are to be found in the female. It is somewhat difficult to explain the development of external female characters such as mammæ in those cases of pseudo-hermaphroditism where testes are present with an infantile uterus. In animals numerous experiments show that there is an arrest of development of the uterus with subsequent atrophy. The external genitals and mammæ remain undeveloped. Tumours of the ovary in children sometimes cause precocious sex development, but this may be due to some increase in the secretion from the adrenal cortex.

After Sexual Maturity.

The results are less marked than before puberty. In the human female the secondary female characters are already acquired, so that the chief changes are cessation of menstruation, with atrophy of the other reproductive organs. Most authors agree as to the onset of uterine atrophy, but differ as to its cause. Some assert that it is due to the cutting off of the blood supply or nerves by the operation itself (Hofmier, Sokoloff, quoted by Marshall, p. 316). Numerous experiments upon the effect of oöphorectomy on the uterus have been published. Carmichael and Marshall found that in rodents the uterus and tubes showed fibrous degenerative changes, the glands diminishing in proportion to the time the animals were kept after removal. The blood-vessels in the uterus were small and few in number. Hospital experience shows that complete removal of both ovaries is followed by cessation of menstruation and subsequent fibrosis and atrophy of the uterus—in fact, a series of events similar to those occurring naturally after the menopause. Menstruation continues if only a portion of the ovary is left behind. There is no experimental evidence that menstruation persists after total extirpation of both ovaries, and those cases in which menstruation is said to have continued after operation are in all probability to be explained by the presence of a small portion of ovarian tissue which has been left behind, or of an adventitious ovarian "rest" in the region of the broad ligament or adrenal glands. Removal of one ovary has little or no physiological effect, as the remaining ovary takes on the function of both, and in some cases becomes hypertrophied. Bond found that in rabbits compensatory hypertrophy took place after coitus and during pregnancy, and concludes that the bilateral ovaries function as one gland in ovulation and internal secretion. Carmichael and Marshall found that hypertrophy occurred independently of ovulation or pregnancy. If one ovary is removed during early pregnancy abortion does not necessarily occur.

(4) EFFECT OF OVARIAN SECRETION DERIVED FROM TRANSPLANTED OVARIAN TISSUE AND FROM ADMINISTRATION OF OVARIAN EXTRACTS.

Transplantation.

The successful results of ovarian grafting are now so well recognized that it is hardly necessary to mention them at any length. The ovary takes on functional activity when transplanted to other situations.

That it may continue to produce ova is proved by cases of pregnancy occurring in animals and in the human female (Morris). Marshall and Jolly prevented atrophy of the uterus after oöphorectomy by grafting ovarian tissue. Kuauer, in rabbits, found that ova were produced and became fertilized. Halban, in young pigs previously castrated, found that ovarian grafts caused uterine and mammary development. In monkeys menstruation ceases after oöphorectomy, but it has been known to recur after ovarian grafting. Most authors lay stress upon the development of the follicles as the essential factor in the promotion of ovarian activity. Limon found degeneration of the follicles, but that persistence of the interstitial cells prevented uterine atrophy. Schultz grafted ovaries into male animals and found growth of ovarian tissue with follicles. Steinach records some interesting experiments where ovaries were grafted subcutaneously in young male guinea-pigs previously castrated, these animals developing female characters, such as enlargement of the mammæ, and changes in the skeletal structures. These results show that the secretions from the male and female gonads are not identical, but are specific in their action. Sex characters developed in animals where the testes were grafted, even when the seminal tubules had disappeared, but with persistence of the interstitial cells. It has been found that grafted ovaries are more successful when transplanted on to animals which have been previously castrated. Carmichael found no evidence that grafts prevented uterine atrophy. Grafts succeed best when implanted into vascular organs, such as the kidney or spleen, although in the human female they are generally applied to the peritoneum of the uterus or abdominal wall. Autoplastic grafts are more successful than those from other animals (heteroplastic).

Successful grafts from animals of different species are not recorded. Degeneration in ovarian grafts is observed to take place first in the follicles; sometimes they become cystic. Degeneration may take place later in ovarian tissue. Natrass found that follicular formation did not take place to the same extent as in normal ovaries. Estrus occurred in animals where the ovaries had been grafted. Guthrie's experiments on fowls are of interest as showing the influence of the grafted gonads upon the offspring. Tuffier gives his clinical experience of ovarian grafting in 130 cases. He found that the grafts were of most value in the prevention of the onset of menopausal symptoms when the uterus was left, and he argues from this that the ovary is a link in the chain between the uterus and a toxin in the blood causing ovulation, and that elimination takes place by means of the uterine mucosa.

Menopausal symptoms were more pronounced if the uterus was removed with the ovaries. In the subsequent discussion on his communication the opinion was expressed that ovarian grafts were of little value unless a portion at least of the uterus was left behind. Further investigation is required as to a comparison between the onset and degree of post-operative menopausal symptoms in cases where the ovaries are alone removed and in those where oöphorectomy with total extirpation of the uterus has been performed. It is questionable whether the total removal of uterus and appendages, as practised by modern surgeons, has not its disadvantages. The operator in his zeal as a pathologist should also remember the physiological importance of the organs removed, and should weigh carefully the exact amount of risk there is to the patient in leaving behind some portion of the uterus or ovaries.

Ovarian Extracts.

Treatment with glandular extracts has been practised with much success in connexion with the thyroid, adrenal and pituitary glands, and it seems surprising that so little advance has been made in the case of ovarian extracts, seeing that the ovary has such a powerful influence upon the body as a whole. The records of the results of treatment are so contradictory that no reliable data can be found to prove its efficiency in gynæcological affections. Numerous experiments on feeding with ovarian extracts and subcutaneous injections have been made and positive results such as resemble the normal effects of the active ovary have been obtained. Ovarian extracts from an œstrous animal injected into an anœstrous one gave transient signs of "heat" (Marshall and Jolly). Extracts from quiescent ovaries gave negative results. Krusen found the best results in the treatment of surgical menopausal symptoms. Morley's results were best when he used extract of the corpus luteum. Experiments by Bell and Hick showed that with fresh extract of sheep's ovaries no contractions took place in the resting uterus, whilst tetanic spasms occurred in a menstruating uterus, and increased contractions in a pregnant uterus. Dellè Chiaje caused fatty degeneration of dogs' ovaries by injecting serum from castrated female dogs, but he obtained similar results when he removed one ovary before taking the serum, thus showing that other factors have to be taken into consideration in his experiments. Fraenkel states that the corpus luteum is the only part of the ovary of any value in the preparation of extracts.

(5) EFFECT OF (a) WITHDRAWAL OF UTERINE SECRETION, AND
(b) ITS RETENTION.

Statements have been made that the uterine secretion has an influence upon the nutrition of the animal and upon the ovaries. Bond found that in rabbits, removal of the uterus caused hypertrophy and overgrowth of lutein tissue in the ovary, and that retention of uterine secretion prolonged œstrus and caused its more frequent recurrence. The retained fluid also interfered with the embedding of the ovum. He asserts that this fluid is prejudicial to the health and nutrition of the animal. He holds the theory that the ovary elaborates only one internal secretion, and that this secretion has an anabolic influence upon the uterus, and at recurrent intervals increases in amount and produces œstrus. Retained uterine secretion is antagonistic to ovarian secretion in the anœstrous state. This theory is not supported by other observers, nor is there any evidence that retained uterine secretion is injurious to the general nutrition. In one case of hæmatocolpos under my care pregnancy followed within a few months after the operation for the fluid. Blair Bell states that menstruation is due to uterine secretion and the menopause to the withdrawal of this secretion. He mentions cases where menstruation occurred after oöphorectomy. Carmichael and Marshall found normal ovarian development after hysterectomy in young rodents, and no degeneration in adult animals. Atrophy of the ovaries after hysterectomy was found by Mandl and Bürger, and also by Zweifel. In such cases it is probable that the vascular supply of the ovaries was interfered with at the time of operation. Dickinson states that four-fifths of his clinical cases of hysterectomy without oöphorectomy were free from menopausal symptoms. Sellheim found no change in the ovaries after hysterectomy.

(6) EFFECT OF OVARIAN SECRETION UPON METABOLISM.

The metabolic changes which take place and which are directly influenced by the chemical action of ovarian secretion are to a great extent still unknown. Experiments have been recorded showing an alteration in the metabolism after castration, but the results are very contradictory, and in many cases the experiments are incomplete. Much further work is necessary before any accurate conclusions can be drawn. The chief means of estimating metabolic changes due to ovarian secretion are its effects upon the growth and general nutrition

of the animal, the respiratory interchanges, deposit of fat, and the output of N, Ca and P_2O_5 . It is supposed that in the human female obesity follows oöphorectomy or the menopause. Oöphorectomy is said to have a beneficial effect upon osteomalacia by diminishing the Ca and P_2O_5 output, but this is a matter of doubt. Most of our information upon metabolism is derived from observations upon animals. After castration of young rodents no change takes place in their growth and general nutrition (Carmichael and Marshall). The fact that animals become fatter after castration is made use of by agriculturists in the rearing of cattle and fowls. It is questionable whether the fat deposit is due to a diminished oxidation energy of the tissue cells or to diminished energy on the part of the animal. Von Noorden tabulates records of workers upon gaseous interchanges, the majority of which show a diminution in castrated animals which were found to be less active than the controls. Luthjé, Loewy, and Richter found increased gaseous interchanges on feeding a female dog with ovarian substance; they diminished on withdrawal of the gland administration. Von Noorden found no change in nitrogen metabolism after castration, and the results of other workers are contradictory. Schrader found retention of nitrogen immediately before and during menstruation. Curátulo and Tarulli found retention of earthy phosphates after castration, whilst after administration of ovarian extract the excretion was increased. Neumann found slight loss of P_2O_5 and Ca as increased excretion in the fæces after feeding with ovarian substance. McCrudden found that castration does not cause a retention of mineral salts.

So much attention is being paid to the calcium metabolism in connexion with thyroid and parathyroid glands that it has been suggested that the ovary also plays an important part in the calcium absorption and excretion. According to von Noorden, calcium is usually found in combination with phosphoric or carbonic acids, and the greater amount of the calcium intake is excreted by the intestine. A certain amount passes into the urine. The greatest absorption occurs in the upper intestinal tract, and the amount of this absorption depends upon the acid reaction of the intestine. The greater part is eliminated by the intestine, either because a certain proportion has not been absorbed, or after absorption and circulation in the tissues it passes into the intestine again. Von Noorden states that calcium salts injected subcutaneously or intravenously pass out quickly and almost entirely by the large intestine. The intestine is therefore the primary channel for excretion of calcium, the kidneys falling into second place. The greater the amount of acid constituents

present in the food, or produced in the body, the greater the amount of calcium found in the urine. With increased acidity of urine its power to dissolve calcium is also increased. In experiments careful analyses must be made of the food given. Vegetables have a higher calcium content than flesh foods. Experimental records must also show the examination of the feces as well as the urine. Blair Bell has found increased calcium in the blood during menstruation, and he has found a higher calcium index in menstrual and hæmatocolpos fluid than in systemic blood. It is probable that there is some relationship between calcium metabolism and ovarian function, but it is difficult to estimate the influence of the thyroid and other ductless glands apart from the ovary. Since the rate of calcium absorption may be dependent upon acid conditions, it is possible that the ovary is responsible for the production of an acid ferment which is poured into the circulation during the pro-œstrum or menstrual period, causing a greater assimilation of calcium by the blood, and its consequent increased elimination by means of the uterus, intestine and kidneys. The high calcium index therefore may be valuable as indicative of the presence of this ferment.

(7) CORRELATION OF OVARY WITH OTHER DUCTLESS GLANDS.

That there is a close relationship between the ovary and other ductless glands is recognized, but what the nature of this is remains unknown. The difficulty in estimating the physiological function of the ovary lies in the elimination of the influence of other glands. How far do these glands act in the production of symptoms hitherto thought to be peculiar to the reproductive organs? In pathological conditions of the thyroid, pituitary and adrenals there are menstrual derangements showing a close connexion between all those glands in the maintenance of the normal equilibrium of the body. Glynn shows that the adrenal cortex is concerned with growth of the sex characters. Neoplasms of the cortex in children are associated with a diminution of the secondary sex characters in females, and a development of the male characters, together with precocious growth of the sex organs and body generally. In female children there is a growth of hair on the face, the mammæ are small, and menstruation is absent. Swale Vincent thinks the adrenal cortex generates a hormone which has a special influence upon growth and nutrition, and especially upon the reproductive organs. The adrenals are said to be enlarged during pregnancy and during the breeding season and after castration (Stilling, Guicysse), and small in

defective sex development. Precocious sex development is found in tumours of the adrenal cortex in the male. Kolmer examined fifty guinea-pigs at different periods of sexual activity, and found increased size of the adrenal cortical cells during pregnancy, having the appearance of lutein cells. He states that in guinea-pigs the adrenals possess a secondary sexual character. It is most probable that the adrenal cortex and the gonads have a close relationship, seeing how intimate is their origin. Adrenalin has been given with success in cases of amenorrhœa and in osteomalacia. Noël Paton, experimenting upon young guinea-pigs, found that the thymus persisted after castration. Henderson showed that in castrated animals the thymus was hypertrophied; the function of the thymus ceases at puberty when the reproductive organs become active. The thyroid is enlarged during pregnancy and menstruation, and goitres are found to be enlarged during these periods, and are most common in women during active reproductive life. In cases of ovarian cytomata under treatment in Professor Munro Kerr's clinic, thyroid enlargement has been frequently observed. In one case under my observation the patient developed a marked goitre after removal of both ovaries for salpingo-oöphoritis. Thyroid extract is of benefit in the treatment of menopausal symptoms and in amenorrhœal derangements associated with mental conditions. The thyroid and parathyroid glands are closely associated with calcium metabolism. The pituitary gland is said to be enlarged during pregnancy and also after castration. In acromegaly there is a disturbance of menstrual function, associated with amenorrhœa, and with uterine and ovarian atrophy. Mackenzie found that infundibular extract caused increased mammary secretion. Obesity is said to follow removal of the pituitary. Osteomalacia has been treated with some degree of success with pituitary extract.

PART II.

DETAILS OF EXPERIMENTAL RESEARCH.¹

The researches embodied in this communication have been undertaken with a view to find out the influence of ovarian secretion apart from reproduction, and to ascertain the physiological function of the different constituents of the ovary by means of transplantation administration of ovarian extracts and metabolism experiments. Experiments upon the influence of uterine secretion were also

¹ The expenses of the research were defrayed by a grant from the Royal Society.

undertaken. Owing to the enormous subject involved, experiments as to the effect of the ovary upon oestrus and ovulation were excluded, and have been reserved for a future detailed research. The experimental work was carried out in the Physiological Research Department of Glasgow University, and I accord grateful thanks to Professor Noël Paton for his unfailing kindness, valuable advice and criticism, and for the facilities he has given me, without which this work could never have been undertaken. I also acknowledge the kindness of Professor Teacher for permission to carry out the histological investigations in the Pathological Institute of the Royal Infirmary.

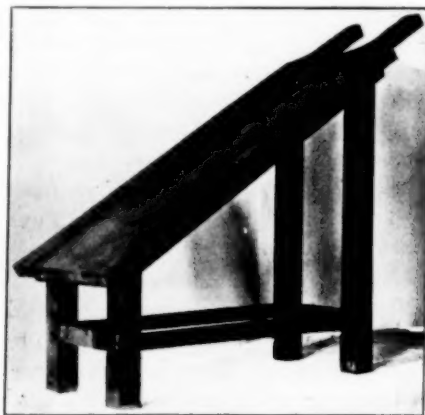


FIG. 1.

Photograph of table for pelvic operations on animals, a modification of the Trendelenburg position. The animal's hind legs are secured to the rests, and the intestine falls away from the field of operation in abdominal operations. About 2 ft. in length and can be placed on an ordinary laboratory bench.

The majority of the experiments were performed upon rabbits, guinea-pigs, and rats. For metabolism work the dog was found to be most suitable. Several experiments were carried out upon monkeys, but for other than histological results these animals were found of little value. By the use of a specially designed operating table (fig. 1) I was enabled to carry out the operations without assistance other than for ether anaesthesia. The animal was placed on this table and its hind limbs secured to the two leg-rests. It was found that in operations upon the pelvic organs the intestine was completely away from the



FIG. 2.

Infantile uterus of young rabbit, kept alive sixty-two days after oöphorectomy. Muscular wall rudimentary. Glands scanty in number. Experiment 1, Series I. ($\times 17$.)



FIG. 3.

Transverse section of uterus of monkey kept alive four hundred days after oöphorectomy. No muscular tissue or glands present. Wall composed of fibrous tissue. Epithelium lining uterus still present. Experiment 5, Series I. ($\times 15$.)
JY—8

field of operation. In operations upon pregnant animals there is very little exposure of the uterus or lowering of temperature, as in operations in the horizontal position. The skin of the animal was cleansed with soap, water and lysol, and shaving was not performed. No after-dressing was applied, with the exception of a strip of wool soaked in collodion. Silk sutures were used except when transplanting ovaries, when catgut was employed. In most cases a central abdominal incision was made, but in guinea-pigs two posterior or lumbar incisions were made. The animals were healthy during the experiments and were kept in isolated cages.

Experiments.—Series I.

To find effect of removal of both ovaries upon the nutrition of the uterus, external genitals, and mammæ, the degree and rate of atrophy, and the deposit of fat.

TABLE I.—EFFECT OF DOUBLE OÖPHORECTOMY UPON THE UTERUS AND MAMMÆ.

Experiment	Animal	Operation	Days kept alive	Results
1	Young rabbit	Double oöphorectomy	62	Uterus infantile and somewhat atrophied; some glands present; mammæ small (fig. 2)
2	Rabbit; pregnant 16 days	Double oöphorectomy; abortion 4 days later	120	Uterus atrophied, most marked in muscular coat; no glands; single row of epithelium lining uterus; increase of stroma tissue; cells vacuolated in places; mammæ small; increase of fibrous tissue
3	Rabbit; pregnant 21 days	Double oöphorectomy; abortion 3 days later	155	Same results as No. 2; blood-vessels reduced in number
4	Rabbit; pregnant 7 days	Double oöphorectomy; abortion (?)	160	Same results as Nos. 2 and 3
5	Adult monkey	Double oöphorectomy	400	Uterus very much atrophied; muscle replaced by fibrous tissue; glands almost entirely disappeared; lining epithelium of uterus present; mammæ small and increase of fibrous tissue; animal well nourished, but no undue deposit of fat (see photograph of uterine wall, fig. 3)

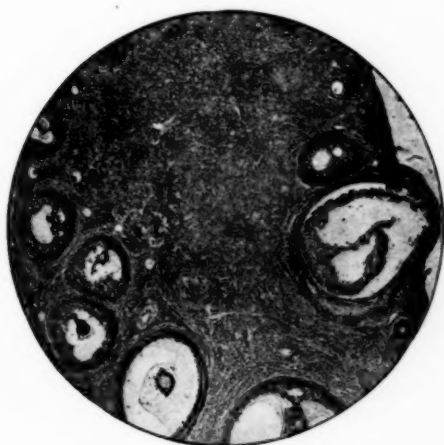


FIG. 4.

Ovary of young rabbit after hysterectomy. Kept alive seventy-five days. Follicles in all stages of development. Corpora lutea seen. Experiment 1, Series II. ($\times 22$.)



FIG. 5.

Ovary of young rabbit after ligation of uterus and retention of saline fluid for one hundred and fifty days. Follicles in all stages of development. Corpus luteum seen. Experiment 3, Series III. ($\times 45$.)

Conclusions from Experiments.—The rabbits showed an enormous deposit of fat; this was not evident in the monkey. Pro-œstrum was not observed in the latter animal subsequent to operation, nor was there any diminution of energy as compared with a control. Abortion followed operation even in later stages of pregnancy. This cannot have been due solely to operative manipulation, as in experiments where the ovaries were not removed abortion did not occur. Uterine function and nutrition are dependent upon ovarian influence. Atrophy of muscular tissue takes place, then diminution in the size and number of the glands. The uterus of the monkey was found to be just exactly one-third the size it was at operation. There is a considerable amount of fibrous tissue present, and the epithelium of the uterus is persistent. The vessels are diminished, but do not show marked atheromatous changes. The mammae were atrophied, and in the monkey the external genitals were small.

Series II.

To find effect of removal of uterus and Fallopian tubes upon the ovaries and general nutrition of the animal.

TABLE II.—EFFECT OF HYSTERECTOMY UPON THE OVARIES.

Experiment	Animal	Operation	Days kept alive	Results
1	Adult rabbit	Complete hysterectomy with Fallopian tubes and cervix	75	Ovaries normal, follicles in all stages of development; corpora lutea present; interstitial cells normal (fig. 4)
2	Young rabbit	Ditto	80	Ovaries normal
3	Adult rabbit	Ditto	100	Ditto
4	Adult rabbit	Ditto	120	Ditto
5	Adult rabbit	Ditto	140	Ditto
6	Adult rabbit	Ditto	150	Ditto

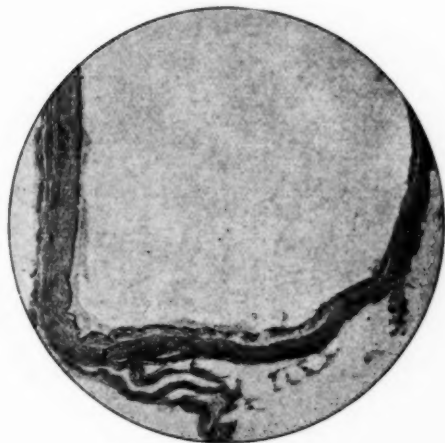


FIG. 6.

Thinned-out uterine wall from retained uterine secretion. Fibrous tissue and epithelium of mucosa present. Experiment 3, Series III. ($\times 27$.)



FIG. 7.

Corpora lutea in grafted ovary, showing hyaline degeneration of lutein cells and leucocyte infiltration at periphery. The interstitial cells were normal. To left is a portion of uterus; no atrophy is present. Experiment 1, Series V. ($\times 6$.)

Series III.

TABLE III.—EFFECT OF RETAINED UTERINE SECRETION UPON THE OVARIES.

Experiment	Animal	Operation	Days kept alive	Results
1	Young rabbit	Left horn of uterus ligatured at each end	70	No fluid found in uterus; ovaries normal
2	Adult rabbit	Right horn ligatured at each end	150	Uterine horn distended with saline fluid, walls thinned and atrophic; other part of uterus normal; both ovaries normal, corpora lutea marked; interstitial cells normal
3	Young rabbit	Both horns ligatured at each end	150	Horns distended with fluid, no muscle or glands in walls, single row of epithelium lining walls; ovaries and cervical portion normal (see photographs, figs. 5 and 6)
4	Adult rabbit	Left horn ligatured at each end	170	Slight dilatation of horn; ovaries normal
5	Adult rabbit	Left horn ligatured at each end	180	Irregular dilatation of horn; wall thinned in places only where distension present; other portion of uterus normal; ovaries normal
6	Adult rat	Left horn ligatured at each end	215	Horn dilated with saline fluid, walls very much thinned; no glands or muscle tissue; other portions of uterus normal; ovaries normal

The animals were well nourished and healthy.

Conclusions.—Retained uterine secretion has no inhibitory effect upon the development of follicles and nutrition of the interstitial cells of the ovary. Corpora lutea are present. The atrophy of the uterine wall at the site of distension is due to the pressure from the retained fluid and not to its influence, as the other portion of the uterus is found to be normal. There is no compensatory hypertrophy in the uterine wall. Retained uterine secretion has no effect upon nutrition, and there is no evidence of its antagonistic influence in animals in the anæstrous state.

Series IV.

To find effect of removal of one ovary in causing compensatory hypertrophy of the other ovary without œstrus or pregnancy, and to find effect of retained uterine secretion upon the occurrence of this hypertrophy. To find effect of retained uterine secretion after removal of both ovaries in counteracting atrophy of the uterus.



FIG. 8.

Cystic corpus luteum in ovary grafted into kidney tissue. Interstitial cells are normal. No atrophy of uterus present. Experiment 3, Series V. ($\times 17$.)

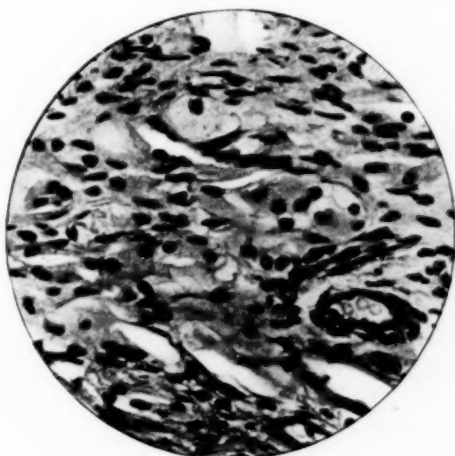


FIG. 9.

Interstitial cells (normal) from ovarian graft. No atrophy of uterus, but follicles cystic. Rabbit kept alive seventy days. Experiment 3, Series V. ($\times 400$.)

TABLE IV.—EFFECT OF REMOVAL OF ONE OR BOTH OVARIES WITH RETAINED UTERINE SECRETION.

Experiment	Animal	Operation	Days kept alive	Results
1	Adult rat	Left ovary removed; right uterine horn ligatured at each end	40	Small quantity of fluid in uterine horn; ovary hypertrophied, interstitial cells increased; uterus normal in non-distended portion
2	Adult rat	Left ovary removed; left horn ligatured	40	Quantity of fluid larger than in Experiment 1; ovary hypertrophied; uterus normal in non-distended portion
3	Adult rabbit	Both ovaries removed; both horns ligatured at each end	290	Uterus small, saline fluid scanty, walls atrophied; glands absent in places; no muscular tissue present
4	Adult rabbit	Both ovaries removed; both horns ligatured; animal recently pregnant	305	Right horn greatly distended with fluid; left distended, but smaller; uterus atrophied all over

Conclusion.—Compensatory hypertrophy takes place in the absence of pregnancy or œstrus, and in the presence of retained uterine secretion. Uterine secretion has no inhibitory effect upon the growth of the ovary, and does not counteract the atrophy of the uterus after removal of both ovaries.

Series V.

To find effect of transplantation of the ovaries upon the uterus and mammæ, and with special reference to the influence of the interstitial cells as contrasted with the follicles (*see* Table V, p. 366).

Conclusions.—Ovarian grafts are not permanent but ultimately degenerate, and the rate of degeneration varies with the site where implantation has taken place; the more vascular the site the longer the persistence of the graft. Degeneration takes place first in the corpora lutea, and is evidenced by hyaline changes in the lutein cells and infiltration by leucocytes; the follicles show cystic degeneration. The interstitial cells persist longest, and control the nutrition of the uterus, as atrophy takes place when these cells are not present, and no atrophy when these are seen without any trace of follicles.

An investigation was made upon the ovary removed from a dog in pro-œstrum and it was found that the interstitial cells were much enlarged and in the neighbourhood of the corpus luteum contained yellow lipoid substance like the lutein cells themselves (figs. 12 and 13). After removal of both ovaries the discharge from the uterus ceased.



FIG. 10.

Normal uterus of rabbit at cervical level, one-half shown; no atrophy.
Experiment 3, Series V. ($\times 38$.)



FIG. 11.

Fibrous remains of graft in abdominal wall of guinea-pig after one hundred and twenty days. Atrophy of uterus was only present to a slight degree.
Experiment 4, Series V. ($\times 17$.)

TABLE V.—EFFECT OF TRANSPLANTATION OF OVARIES UPON THE UTERUS AND MAMMÆ.

Experiment	Animal	Operation	Days kept alive	Results
1	Adult rabbit; recently pregnant	Double oöphorectomy; cortex of one ovary grafted on to uterine wall	40	No uterine atrophy; mammae normal; commencing degeneration of corpora lutea, hyaline, and infiltration by leucocytes; interstitial cells normal (see photograph, fig. 7)
2	6 months old rabbit	Double oöphorectomy; piece of cortex grafted into right kidney	60	No uterine atrophy; mammae larger than at operation (control by microscopical examination); degenerated follicles in kidney tissue; interstitial cells normal
3	Adult rabbit	Double oöphorectomy; piece of cortex grafted into right kidney	70	Corpus luteum in graft cystic; interstitial cells normal; uterus does not show atrophy; mammae normal (see photographs, figs. 8, 9, 10)
4	Adult guinea-pig	Double oöphorectomy; pieces of cortex grafted on to peritoneum of abdominal wall	120	Atrophy of uterus only to a slight degree; interstitial cells in grafts; no follicles to be seen (see photograph, fig. 11)
5	Adult rabbit; pregnant 16 days	Double oöphorectomy; small piece of cortex of human ovary grafted on to kidney; abortion next day	200	Uterus atrophied; no evidence of graft; mammae small
6	Adult rabbit	Double oöphorectomy; piece of cortex grafted into uterine muscle	200	Mammae normal; atrophy of uterus not observed, but glands scanty; no follicles in graft; interstitial cells more type of stroma cells

A series of experiments are being carried out upon the effect of corpus luteum on blood-pressure, and although the results are incomplete, it has been found that extract of corpus luteum had a marked effect in the causation of a rise of blood-pressure. Extracts from quiescent ovaries had practically no effect, thus showing that the corpus luteum contains the most active physiological substance in the ovary.

A number of patients suffering from menopausal symptoms (natural and post-operative) were treated by me with corpus luteum extract supplied by Messrs. Parke, Davis and Co., and it was found of benefit in those suffering from surgical menopausal symptoms. In cases of natural menopause thyroid extract seemed to have better therapeutic effects.

A series of experiments upon calcium metabolism are in process, and

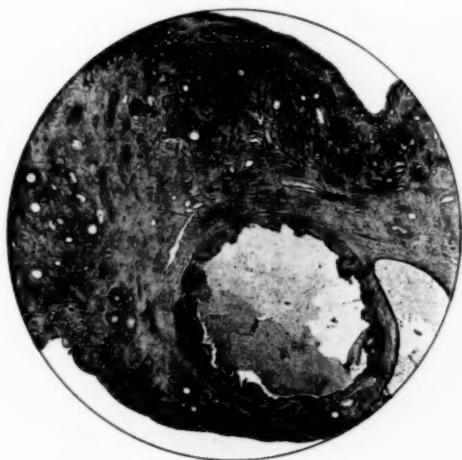


FIG. 12.

Ovary of dog removed during pro-œstrum. Corpus luteum shown. ($\times 12$.)

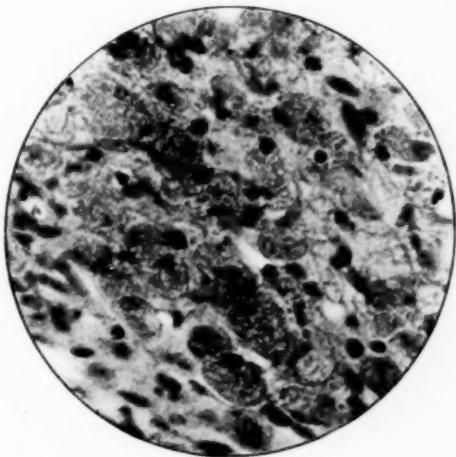


FIG. 13.

Interstitial cells from ovary of dog removed during pro-œstrum. Much enlarged, and cytoplasm filled with lipoid substance. ($\times 400$.)

it has been found on completion of one experiment upon a female dog that the results were contrary to what was anticipated. The animal was put on a known calcium diet and kept in a metabolism cage for six days. Daily collections were made of the urine and feces, and the nitrogen and calcium were estimated. The animal was castrated and after some weeks was put up in the cage under the same conditions as before operation. The calcium output was not diminished, and on the administration of corpus luteum extract (Parke, Davis and Co.) there was diminution in the amount of calcium excreted. These results agree with those of McCrudden, and although no conclusions can be drawn from one single experiment, there is a certain amount of justification for the statement that the ovaries may not play such an important part in the calcium metabolism as is supposed by those who advocate oöphorectomy for the treatment of osteomalacia, but that other factors have to be taken into consideration, more especially those concerned with the metabolism of the thyroid and parathyroid glands. And it may be just possible that the ovary—or gonads in general—is a link in the chain of metabolic processes which take place, and which owe their origin and regulation to the ductless glands as a whole. The removal of one set of organs may not have a direct influence upon metabolism, but may upset the normal physiological equilibrium of the remainder, just as in pathological conditions of these organs a train of symptoms follow which can be traced to the overthrow of balance or equilibrium in the organism.

CONCLUSIONS FROM EXPERIMENTS.

(1) The ovary controls the nutrition of the uterus and other reproductive organs, since removal of both ovaries causes atrophy of the muscular and glandular elements of the uterus, &c., the degree of atrophy being in direct proportion to the length of time which has elapsed since the operation. There is also a diminution in the uterine blood-vessels, and a tendency to atheroma—a condition very closely allied to fibrosis of the uterus in the human subject. Menstruation and œstrus do not occur after complete removal of both ovaries. In young animals after oöphorectomy the infantile type is maintained.

(2) Removal of the uterus, or retention of uterine secretion, does not affect the functional development of the ovaries, seeing that the elements of the ovary are well preserved after hysterectomy and ligation of the uterine horns. Retained uterine fluid does not counteract the atrophy of the uterus which takes place after removal of both ovaries. There is

thinning out of the uterine wall at the point of greatest distension, and no compensatory hypertrophy has been observed.

(3) Removal of one ovary causes compensatory hypertrophy of the other in the anæstrous state.

(4) That the interstitial cells perform the chief rôle in the maintenance of the nutrition of the uterus is evidenced by (a) the survival of these cells in grafted ovaries, (b) the follicles becoming absorbed or cystic, and (c) the fact that no atrophy of the uterus occurs when these cells are present. The interstitial cells become functionally active during pro-œstrum, as shown by their being enlarged and their cytoplasm becoming infiltrated with a lipoid substance (in female dog). That the corpus luteum is the part of the ovary which exerts the most active influence upon the body as a whole is shown by the fact that corpus luteum extract when injected causes rise of the general blood-pressure.

(5) From the result of one experiment it was found that the ovaries do not play such an important part in the elimination of calcium as is supposed, since after castration the calcium output was increased, whereas it was diminished as the result of administration of corpus luteum extract.

(6) Removal of the ovaries in rabbits causes an increased deposit of fat in the tissues of the body.

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Dr. GRIFFITH remarked on the great interest of the very numerous points which were crowded into the paper, and hoped that at the discussion which was to take place next winter a selection of some of the more important points would be especially brought forward. He wished to lay stress on the absolute necessity of endeavouring, as far as possible, to distinguish between uterine hæmorrhage and the complex process of menstruation. With regard to the question as to the nutrition of patients suffering from retention of menses, he would refer to the first and the last cases he had had under his own care. The first was a healthy, well-built nurse in one of the asylums, where the tumour was so considerable that she was sent to him by her matron to see if she were pregnant. The last he had operated on that morning, a young girl aged 16, one of the poor girls of London, whose nutrition was up to the average, but in whom the breasts presented signs of quite considerable activity, but without secretion.

Obstetrical and Gynaecological Section.

July 4, 1912.

Dr. AMAND ROUTH, President of the Section, in the Chair.

The Pathology of Uterine Casts passed during Menstruation.¹

By W. BLAIR BELL, M.D.

THE exhibitor showed specimens of :—

- (1) Blood casts, which consisted of blood that had clotted in the uterine cavity and become moulded to the shape of that cavity.
- (2) Endometrial casts, both thick and thin; these all showed a distinct decidua-like reaction in the stroma.

The pathology of the former (blood casts) was explained as being due to the fact that the endometrium failed to extract the fibrin ferment either because the hæmorrhage was too profuse or too rapid.

The pathology of the latter (endometrial casts) was stated to be due to the fact that there is extensive menstrual decidua-like reaction, which renders the endometrium much denser than usual. Consequently the blood, which cannot break through into the uterine cavity, strips up the membrane either in its superficial parts or throughout its whole depth.

DISCUSSION.

Dr. GRIFFITH was surprised that Dr. Blair Bell, in his very interesting specimens, had not described any of them as inflammatory. One in particular, which Dr. Blair Bell had said had been passed in several small fragments,

¹ Vide previous communication on this subject, *Proceedings*, pp. 153-58.

appeared to have the ordinary characteristics of an endometritis. Amongst the uterine casts, allied to the blood casts, were those consisting of viscid mucus, stained with blood; they were usually small and stringy.

Mr. TARGETT had examined microscopical sections of many similar specimens, and he was of opinion that it was not difficult to distinguish them from true decidual casts. The granular, semi-neerotic condition of the stroma of the menstrual cast was very characteristic, and there was no general swelling of the connective tissue elements as in a decidual membrane.

Sequel to Case of Bilateral Carcinomatous Sarcoma of the Ovaries.¹

By W. BLAIR BELL, M.D.

THE patient, who is now dead, developed recurrences in the omentum which, on section, were found to be carcinomatous in nature (figs. 1, 2). This was considered to be conclusive proof that the original tumours consisted both of carcinoma and sarcoma.

REPORT OF THE PATHOLOGY COMMITTEE.

The Committee was unanimous on the following points: (1) The main features of the primary growth were those of a sarcoma; (2) the main features of the secondary growth in the omentum were those of a carcinoma; (3) both primary and secondary growths were malignant. In the opinion of Dr. Bryden Glendining, both tumours contained the same tissue elements, and were therefore compound malignant tumours.

The Committee thanked Dr. Blair Bell for the opportunity of re-examining the specimens of uterine membranes that he submitted at the July meeting.

¹ Shown at the meeting held on January 4, 1912; see *Proceedings*, pp. 158-64.

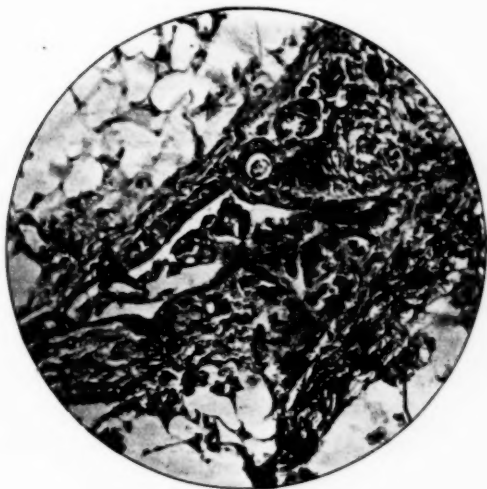


FIG. 1.

Carcinomatous recurrence in the omentum, secondary to the primary growth in the ovaries. Irregular gland formation is seen.

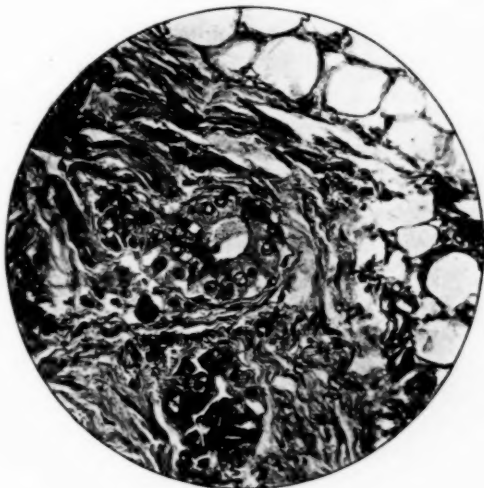


FIG. 2.

Carcinomatous recurrence in the omentum, secondary to primary growth in the ovaries. A gland is seen in the centre of the field.

Double Ruptured Ectopic Gestations.

By E. TENISON COLLINS.

CASES of simultaneous double ectopic pregnancies are so uncommon that I think the specimens I now show will be of interest to the Section.

The patient, Mrs. B., aged 33, was sent down to King Edward VII Hospital at Cardiff late on Sunday night, April 7, 1912, by Dr. Thomas, of Bargoed, who had diagnosed the case as one of ruptured tubal gestation. Her previous history was that she had had four children, the last two and a quarter years ago, and two miscarriages, the last one four years previously. Her last menstrual period was on February 3, or eight weeks before admission. About the middle of March she fell over a 5-ft. wall in her garden, and three days later was seized with pain in the left side, and the abdomen began to swell. On April 1 she had slight vaginal hæmorrhage with pain, and went to bed. She passed nothing suggesting a decidua.

On admission she was very anæmic, pulse 110, and respirations 28, but no marked sign of collapse. There was dullness over the lower abdomen, and on vaginal examination the uterus was fixed in a somewhat solid mass.

On April 8 (the following morning) I opened the abdomen and found a ruptured left tube, which I removed. On examining the right appendages I found to my surprise another ruptured tube with a small fœtus outside still attached by the cord, which, however, broke on removal. After removal of a large quantity of blood clot, some hot saline solution was run into the abdomen and the incision closed.

The specimens were sent to the Pathological Department and examined by Professor Emrys Roberts, who reports: "Left tube $6\frac{1}{2}$ cm. long, 3 cm. diameter in centre; rupture of middle third; end sealed with blood clot. Microscope shows fœtal villi, and in blood clot removed with it and kept distinct from left side, an amniotic sac $5\frac{1}{2}$ cm. in diameter, but no trace of fœtus; estimated period seven weeks. Right tube 8 cm. long, $4\frac{1}{2}$ cm. diameter at outer third, ruptured along anterior and upper margin; well-marked amniotic sac with umbilical cord attached. Fœtus 4 cm. long found extruded in blood clot."

The patient made an uninterrupted recovery, and left the hospital on the twentieth day.

Mr. TENISON COLLINS, in reply to Mr. Targett, said that he had several times seen hematoma of the opposite tube, but never rupture, and the report on the left tube stated the presence of fœtal villi and an amniotic sac which removed all shadow of doubt as to the case being one of double tubal pregnancy.

PRESIDENTIAL ADDRESS.

By AMAND ROUTH, M.D.

THE Session of 1911-12 has been without special incidents. The work done, especially by our younger and also by our provincial members, has been both interesting and instructive. Efforts are being made on all sides to unravel some of the many mysteries of ætiology. Skilled appeal has been made to physiological chemistry, that most difficult of allied sciences, with regard to the toxæmias of pregnancy, by Dr. Swayne, of Bristol; and Dr. Louise McIlroy, of Glasgow, has added much to our knowledge of the action of ovarian secretions. I wonder if the physiological chemists attached to our London schools could not be encouraged to make systematic chemical investigations of the blood and secretions of toxæmic patients in our hospitals, somewhat on the lines of Dr. Swayne's paper on "Acidosis in Pregnancy." If so, our knowledge of the the toxins present would be gradually built up, and treatment would become more defined and useful.

WORK OF SESSION 1911-12.

OBSTETRICS.

Ectopic Gestation.

Several specimens illustrating various types of ectopic gestation have been shown during the session, but still much information is needed, especially as to its causation, and the significance of the passage of a uterine cast.

(1) *Unruptured Tubal Gestation (Four Months).*—In October, Dr. Drummond Maxwell showed a large gestation sac reaching to the umbilicus, which he had removed by laparotomy from a woman, aged 25, who had only been married five months. The sac was found to be an unruptured tube, though the gestation had presumably continued for four months. The size of the fœtus and condition of the placenta corresponded to the duration of the pregnancy. The author drew attention to the fact that no uterine cast was passed till after the operation, and stated that in the London Hospital a uterine cast had

only been passed previous to operation in 5 or 6 per cent. of 150 cases operated on by Dr. Lewers and Dr. Russell Andrews.

(2) *Double Ruptured Ectopic Gestation*.—At the July meeting Mr. Tenison Collins, of Cardiff, showed specimens of double ectopic gestation with rupture of both Fallopian tubes. On the one side the foetus was seen escaping from the rent, on the other side chorionic villi were found. Both tubes were much distended with blood.

(3) *Ovarian Pregnancy*.—In December, Dr. Eardley Holland showed a specimen of ovarian pregnancy. The gestation sac was completely encapsulated by ovarian tissue. Rupture of the sac had apparently occurred at the sixth week of gestation, and other internal hæmorrhages occurred during the next three months. Dr. John Phillips then removed the ovary. The other ovary (left) had a recently ruptured Graafian follicle from which blood clot was protruding. The ovary was left in situ, but the clot was carefully examined and was found to contain multinucleated protoplasm, which the author believed to be trophoblastic in nature, and possibly a part of a fertilized ovum. The Pathology Committee adopted his view.

(4) *Ectopic Gestation at and after Full Term*.—Four cases of laparotomy for ectopic pregnancy at or after full term have been recorded during the session. The first was described in November by Dr. Savage, of New Zealand, the patient when seen being supposed to be in labour at full term. Foetal movements and heart sounds were detected over the gestation sac. At the laparotomy the sac was bounded by the uterus, broad ligament, the great omentum, and transverse colon. The placenta was adherent to the under surface of the omentum. After tying the ovarian and some omental vessels, entry to the sac was obtained by detaching the omentum from the fundus uteri and a living child was extracted. The placenta was rapidly detached, and the furious bleeding which followed was checked by ligatures and gauze packing. The sac aperture was partly closed and sutured to the parietal peritoneum at the edge of the abdominal wound, and the sac drained with gauze. In December, Dr. Tate related a similar case removed three months after full term. The gestation sac and placenta were removed entire without difficulty, and no drainage was required. At the same meeting the President mentioned a very similar case operated on by Cypriani and described in his book written in 1695. Laparotomy was performed twelve months after term, the placenta coming away with the sac, but here drainage was needed, as the sac contents were septic. A fourth case was described by Dr. Henry

Briggs, of Liverpool, in March, operated upon three months after term. Part of the sac was left, but the placenta, which weighed over 2 lb., owing to hæmorrhage into its tissues, was easily removed. A glass drainage-tube was used. These four cases, all of which recovered, confirm the view that, if an extra-uterine gestation can be left till three months after full term, the placenta is easily removable owing to arrest of the placental circulation, and the mother's safety is fairly secured. The question has yet to be decided whether this enhanced security of the mother justifies us in deliberately waiting till after full term, when the case is seen at the seventh or eighth month and the child is living.

Pregnancy in Bicornuate Uterus: Rupture of Rudimentary Horn.
—Allied to these ectopic pregnancies was a case of pregnancy in a rudimentary horn of a bicornuate uterus described by Mr. Beckwith Whitehouse, of Birmingham, at the December meeting. This had ruptured after four months' amenorrhœa. The operation was performed next day. There was no communication between the cavity of the rudimentary horn either with the other horn of the uterus or with the vagina, so that, as in most of these cases, fertilization was accomplished by external migration of a spermatozoon, or possibly by the external migration of an ovum already fertilized on the other side of the pelvis.

Affections of Chorion and Placenta.

Affections of the chorion and placenta have, as usual, been dealt with during the session, for our knowledge of their functions and their diseases is still very imperfect.

(1) *Hydatid Moles.*—In December Dr. Drummond Maxwell described a case where a hydatidiform mole had been removed seven weeks before admission, and states that more of the material came away four weeks later. As bleeding continued, Dr. Lewers explored the cavity and removed with his fingers more cystic material, a blunt curette being then used. The pathological report stated the hydatidiform mole was malignant, but the patient was too weak to have a radical operation. Two months later the patient had another hæmorrhage, and was readmitted, and the uterus was again explored, and a collapsed vesicle was curetted from the fundus. Microscopically, projections of chorionic epithelium were found both in removed portions of mucosa and in the uterine muscle. The patient's general condition again prevented further surgical treatment. There was no evidence of

mischief in the lungs. A month later the uterus was again explored, and nothing abnormal found. Patient was quite well six months later, and presumed to be pregnant. This case and another mentioned by Dr. Hubert Roberts opened up the important pathological and clinical questions of what constitutes malignancy in a hydatid mole, and how the varying degrees of malignancy of chorionepithelioma can be determined.

(2) *Relative Size of Hydatid Moles.*—A further contribution to our knowledge of hydatid moles was made in January by Dr. Henry Briggs, who read a valuable paper on twenty-three cases of hydatid mole, and showed that in sixteen cases from this series (69 per cent.) the uterus was below the normal size of the uterus at the supposed date of pregnancy. Only four out of the twenty-three cases were oversized, and in each of these cases much blood was found in the mole or *in utero*. In many of the undersized moles quiescence, and even recedence of the mole, had been noted. Two of the twenty-three cases were followed by chorionepithelioma. In one case the hydatid mole had been undersized, in the other oversized—due to a large quantity of concealed hæmorrhage. An interesting discussion followed Dr. Briggs's paper. The whole subject of hydatidiform mole needs careful revision and elaboration.

(3) *Rupture of Umbilical Vessels of the Placenta.*—In April, Dr. Williamson related a case where death of the child was due to rupture of the umbilical vessels of the placenta during labour. The insertion of the cord, as in most recorded cases, was velamentous, a condition which is computed to occur in seven cases per 1,000, and about ten times as frequently in twin pregnancies, and still more frequently in uni-ovular twins. He related two other cases, and discussed the diagnosis (possible only in an early stage of labour), the prognosis and the treatment. Dr. Williamson considered that if diagnosis was made early in labour, Cæsarean or vaginal section gave the child the best chance, otherwise the child was almost sure to die. At the same meeting Dr. Maxwell, Dr. Hedley, and Dr. Barris also showed specimens of velamentous insertion of the cord where rupture of placental vessels had occurred. These cases opened up a new line of thought regarding the causes of stillbirths.

(4) *Angio-chorioma of Placenta.*—In January, Dr. Drummond Maxwell described a rare form of tumour, "Angio-chorioma," embedded in the placental tissue, but deriving its blood supply directly from the vessels of the umbilical cord, and not from the contiguous

placenta. The ætiology of the growth was attributed by Dr. Maxwell to venous stasis in a primitive placental cotyledon, occurring in the second or third week of pregnancy, with resulting intracapillary pressure.

Diseases of Pregnancy.

Diseases of pregnancy have not been dealt with as much as I had hoped, for, as I have already said, I believe that the time is ripe for a more precise knowledge of the toxæmias of pregnancy. Still, we have had one extremely valuable and suggestive paper on "The Clinical Significance of Acidosis in Pregnancy," at the May meeting, by Dr. Swayne, of Bristol.

(1) *Acidosis in Pregnancy.*—Dr. Swayne admitted that his tests for acidosis were necessarily more adapted to the clinician than to the expert physiological chemist, and he did not attempt to explain the alteration of metabolism causing the acidosis. He confirmed Leith Murray's view that acidosis was often present in the toxæmias, causing hyperemesis gravidarum, and eclampsia, and he advised against the use of chloroform anæsthesia in eclampsia, as it increased the acidosis. He advised induction of labour if acidosis was markedly present in albuminuria, even if the latter was due to a pre-existing chronic nephritis. In the treatment of the toxæmias of pregnancy, where acidosis was present, special treatment by alkalies was essential. Work, such as this paper displays, cannot but help to greatly extend our knowledge of the toxæmias of pregnancy.

(2) *Pyelonephritis of Pregnancy.*—With similar scientific accuracy Dr. Williamson and Mr. Barris, at the November meeting, dealt with a fatal case of pyelonephritis of pregnancy, showing the essential organs concerned. The patient, aged 19, had the usual symptoms, but improved rapidly under urotropine and citrate of potassium. The *Bacillus paratyphosus* was found in large quantities in the urine, but not in the fæces or in the blood. It was, however, found by catheterization of the right ureter under anæsthesia to be present in the renal pelvis. After the ureteral catheter had been passed the patient's colour became blue, her respiration rapid, her temperature rose, and she died in twelve hours. A full description of the post-mortem conditions found is given: The lungs were engorged and œdematous; the right ureter was dilated upward from the brim of the true pelvis, the left throughout its whole length. Small cortical abscesses, in which *Bacillus paratyphosus* was found, were present in both kidneys. The case is extremely valuable,

not only from its being the only case known of infection during pregnancy by *Bacillus paratyphosus* and from its unfortunate ending after the passage of a ureteral catheter, but also because the pathological condition of the ureters and kidneys found at the autopsy is given with such accuracy and fullness of detail. The authors considered the renal infection had occurred via the blood-stream rather than by the ascending route from the bladder, and they looked upon ureteral catheterization, which had been performed without mishap by Dr. Barris in twenty-one similar cases, a useful procedure, both for the purpose of diagnosis and for washing out the renal pelvis.

(3) *Pregnancy complicated by Fibroids*.—At the June meeting, Dr. Purslow, of Birmingham, showed a uterus, gravid four months, with multiple fibroids, one of which had undergone cystic degeneration. The pain was severe, and there was slight pyrexia and rapid pulse. Dr. Purslow had felt it necessary to perform abdominal subtotal hysterectomy. The members of the Obstetrical Section of the Royal Society of Medicine always look sad when a fibromyomatous uterus, removed during early gestation, is exhibited, but Dr. Purslow's reputation convinced them that in this instance it was not possible either to have awaited the viability of the fœtus and then perform Cæsarean section, or to have done a myomectomy at the laparotomy instead of hysterectomy.

(4) *Retroversion of the Gravid Uterus with Hæmaturia*.—In April Dr. Barris related the case of a woman who had retroversion of the gravid uterus, complicated by over-distension of the bladder and hæmaturia. He drew attention to the absence of cystitis, and thought the hæmaturia might have been caused by the rupture of a varicose vessel in the bladder wall, as has been demonstrated in other cases. In the discussion it was suggested that the hæmorrhage was due to separation of the mucous membrane from its attachments during great distension, owing to the fact the mucous membrane did not stretch as easily as muscle or peritoneum; others thought it might have been due to too rapid emptying of the bladder.

Labour.

Difficult Labour.

(1) *Dystocia due to Coils of Cord round Fœtus*.—In March, Dr. Briggs described a case where he had performed Cæsarean section for dystocia, due to coils of cord round the fœtus. The uterus was extremely retracted, labour having already lasted fifty-five hours. The

hand could not be passed beyond the vault of the foetal head, and, as the child was alive, Cæsarean section was performed, both mother and child living. No such case is recorded amongst the 1,200 collected by me from Great Britain and Ireland, though there were ten Cæsarean sections done for obstructed labour with tonic contraction of the uterus. Three of these were for relatively large or impacted heads, two of them were for impacted mentoposterior presentations, and five were performed for impacted shoulder presentation.

(2) *Dystocia due to Fœtal Œdema*.—In June, Mr. Clifford White showed a fœtus with generalized œdema; the mother was badly nourished but otherwise healthy. The face presented, and the head was delivered by forceps as the fœtal heart began to fail. The body was delivered by traction. Besides the general œdema there was free fluid in all the serous cavities; the viscera were healthy; the placenta showed slight œdema of the villi. No *Spirochætæ pallidæ* were found, though the obstetric history of the mother suggested syphilis. Mr. White discussed the causation of this condition, which is obscure and probably variable.

(3) *Dystocia due to Premature Contraction Ring*.—At the same meeting two important papers, bearing on the physiology of labour, were read by Dr. Willett and Dr. Williamson, on cases of dystocia due to the formation of a premature contraction ring. These papers will help to explain this rare occurrence and to focus its treatment. Dr. Willett treated his case by continuous weight traction after craniotomy, the child being dead.

(4) *Dystocia due to Rigidity of Cervix and Placenta Prævia*.—At the May meeting Dr. Lockyer described a case where he had been obliged to perform embryotomy after version for placenta prævia. He had succeeded in bringing down the half-breech after version, but leg traction failed to deliver, and, as it was evident that the child was dead, he performed embryotomy. Sir Francis Champneys and Dr. Spencer would have preferred to do version without subsequent traction upon the half-breech. The former obstetrician alluded to the value of opium in such cases, saying that the pure drug (laudanum) either produced refreshing sleep followed by renewed vigour, or it acted as an oxytocic tending to rapid delivery.

(5) *Extraperitoneal Cæsarean Section*.—At the same meeting Dr. Russell, of Glasgow, read an important paper on "Extraperitoneal Cæsarean Section," giving details of seven cases. He had been able to save all the children and six of the mothers, one dying under

chloroform. Dr. Russell agreed with most obstetricians, that the operation should be reserved for cases advanced in labour, when the lower uterine segment is stretched by the presenting part, but also thought it useful for certain cases of placenta prævia when the child is alive. Unlike most British authorities, he did not find hæmorrhage to be more severe, nor did he find that the wound healed less satisfactorily than in the classical operation, or that hernia was more likely to follow. Most of the speakers who discussed his paper disagreed with these last conclusions.

(6) *Missed Labour*.—Two cases were shown by Dr. W. C. Swayne. In the first case the fœtus had apparently died at full term, and, after two months' offensive purulent discharge, Dr. Swayne emptied the uterus, the fœtus being putrid and rotten, the uterine tissue tore like blotting-paper, and the patient did not long survive the operation. In the second case, which occurred in 1896, slight labour pains came on about the date of the expected pregnancy but passed away. Pains again occurred eleven months later, and the child, which was alive *in utero*, was removed after craniotomy and evisceration had been performed, the fœtus then weighing 14½ lb. Nowadays, of course, as Dr. Swayne said, Cæsarean section would have been the treatment. Some very interesting remarks by Dr. Herman followed the reading of this paper.

Diseases of the Puerperium.

The Treatment of Puerperal Septicæmia.—At the February meeting the subject of "Vaccine Therapy as a Cure of Puerperal Septicæmia" was brought forward by Dr. Western, who gave statistics of fifty-six cases from the London Hospital, where inoculation with autogenous vaccine had been adopted, and of forty-six cases where it had not been used. He found that the mortality of the former was 32 per cent., and of the latter 55 per cent. He further showed that the mortality of cases where bacteria were found in the blood-stream was usually about 90 per cent., but that inoculation by autogenous vaccines had reduced the mortality of his cases to 55 per cent. The author found bacteria in the blood in thirty-nine cases, or 46 per cent., and of these thirty-nine cases thirty-six contained streptococci and two *Staphylococcus aureus*. Cultures from the uterus were taken in forty-three cases. Streptococci grew in pure culture in thirty-one of these, streptococci and coliform bacilli in two, *Staphylococcus albus* in one, and in only seven cases were the results negative. A valuable and interesting

discussion followed. Dr. Williamson strongly advised that no auto-genous vaccine should be used till it was certainly sterile, and that during the period of its preparation (about forty-eight hours) a stock anti-pyogenic serum should be injected. The President thought Dr. Western had proved his point as regards the value of autogenous vaccines in local infections with a general toxæmia, but not in cases of true general septicæmia. This paper will stimulate obstetricians in other maternity institutions to record their results, and if this could be done it would form the basis of a joint discussion in which obstetricians and bacteriologists could usefully meet, and perhaps agree upon some routine treatment, and thus lessen the enormous maternal mortality of childbirth, which still persists; for in five years, 1906-10, about 60 per cent of the notified cases of puerperal fever died. I am glad to say, however, that the total mortality from puerperal fever is steadily diminishing. In my Presidential Address last October I pointed out that the minimum death-rate in England and Wales from puerperal fever was in the year 1908, and it was then 1·48 per 1,000 births, but that it had gone back a little, to 1·56 per 1,000, in 1909. As a result, however, of further progress, both in prevention and treatment, the death-rate in 1910 fell to 1·42 per 1,000 births, the smallest death-rate ever recorded, and this represents a saving of 155 lives between those two years.

Prevention of Puerperal Melancholia by Hysterectomy during Pregnancy.—The only paper touching on puerperal insanity was read by Dr. Walter Griffith, at the February meeting, and the originality of the treatment, or rather of the prophylaxis, caused some criticism. In order to prevent the patient from developing melancholia after labour, as she had done on two previous occasions, Dr. Griffith performed supravaginal hysterectomy when she was again three months pregnant. The patient, aged 24, was confined in May, 1907, and ten days afterwards she developed melancholia with suicidal tendencies. She had another child in February, 1910, and mental depression recurred in the fourth week after labour, and continued for five months. In January, 1911, she was found to be again three months pregnant. She was anxious to have another child as the other two were healthy, but was also anxious as to her ability to go through the pregnancy and puerperium safely. Dr. Griffith consulted with Dr. Percy Smith, and they agreed that the pregnancy should be terminated, and that the patient should be sterilized to prevent recurrence of pregnancy. Dr. Griffith came to the conclusion, and Dr. Percy Smith concurred, that

supravaginal hysterectomy was in this case preferable to evacuation of the uterus followed at a later date by a sterilizing operation. This operation was successfully performed, the tubes and ovaries being left. There was some evidence of depression on the second day after the operation, but otherwise convalescence and subsequent health have been excellent. In the discussion it was pointed out that induction of abortion as a prophylactic of puerperal melancholia was rarely adopted, and that sterilization by any method must be still more rarely indicated, and might even induce the very depression which it was performed to prevent. In his reply Dr. Griffith agreed that this line of treatment would be very exceptionally indicated.

Fœtal and Infantile Diseases.

I am glad to say that several interesting communications have dealt with these conditions.

(1) *Epignathus*.—I have already dealt with Mr. Clifford White's case of dystocia due to fœtal œdema. At the same meeting in June Mr. White also showed a remarkable specimen of epignathus, a very rare condition, the tumour growing from the base of the skull near the body of the sphenoid, and protruding from both the mouth and nostrils. The specimen belongs to the variety of epignathus called sphenopagus. The child was alive at birth and presented by the vertex, but died in a few minutes. The growth was covered by squamous epithelium, and was mainly of embryonic connective tissue containing spaces filled with blood, miniature gland areas, and hair-follicles. Cartilage, bone, teeth, and hair were also found. The specimen was clearly not a parasitic acardiac amorphous fœtus as has been suggested, but a separated portion of the germ-plasm of the autosite, and analogous to coccygeal teratomata.

(2) *Blood-pigment in the Fæces of the New-born*.—In February, Dr. Hector Colwell and Dr. Glendining read a paper on the "Presence of Blood-pigment in the Fæces of the New-born." They examined the fæces of fifty new-born infants, and found that blood-pigment was present in the fæces of about 30 per cent. during the first three or four days, and they believe that this is due to circulatory disturbance after birth which leads to minute hæmorrhages into the intestinal canal. If, however, it was found in the meconium at birth, probably some other explanation was required.

(3) *Sacral Teratoma in a New-born Child*.—In March, Dr. Lediard, of Carlisle, showed a sacral teratoma weighing 4 lb., which was removed

from a female infant 2 days old. She was quite well in her eighth year. The structure consisted of cartilage, some of which was undergoing ossification, tubes lined with epithelium, gland areas containing small acini, with cubical epithelium, and true bone.

(4) *Congenital Graves's Disease*.—At the same meeting Mr. Clifford White showed the thyroid gland and adjacent parts of a foetus with congenital Graves's disease. The child only lived thirty-four hours. The mother developed well-marked Graves's disease when five months pregnant. After the child's birth she improved in all respects, but in six months again became pregnant and had a stillborn child at the seventh month with no abnormalities. The autopsy on the child shows no organic disease of the other ductless glands. The case is one of great interest, both from the foetal and maternal points of view. Graves's disease is almost unknown before the age of $2\frac{1}{2}$ years, and no other case appears to be recorded of a case at birth. The association and interaction of pregnancy and Graves's disease is of great interest as bearing upon the function of the ductless glands and the whole question of the toxæmias of pregnancy.

GYNÆCOLOGY.

Before reviewing the pathological communications of the session, I must first draw attention to Dr. Louise McIlroy's paper on the "Physiology of Ovarian Secretion," read at the June meeting. The paper contains conclusions founded on clinical experience and experiment, and adds much to our knowledge of the influence of ovarian secretion upon the functions of the uterus, the ovaries, and the mammae, and on the general well-being of the individual. Dr. McIlroy discussed the relationship of the ovarian constituents to menstruation, ovulation, pregnancy, and lactation; the effect of the suppression of ovarian secretion before and after sexual maturity; the effect of transplanted ovarian tissue and of administered ovarian extracts; the effect of ovarian secretion upon metabolism; and the correlation of the ovary with other ductless glands. The following conclusions were formulated:—

(1) The ovary controls the nutrition of the uterus and other reproductive organs, since removal of both ovaries causes atrophy of the muscular and glandular elements of the uterus, &c., the degree of atrophy being in direct proportion to the length of time which has elapsed since the operation. There is also a diminution in the uterine blood-vessels and a tendency to atheroma—a condition very closely allied to fibrosis

of the uterus in the human subject. Menstruation and œstrus do not occur after complete removal of both ovaries. In young animals, after oöphorectomy the infantile type is maintained.

(2) Removal of the uterus, or retention of the uterine secretion, does not affect the functional development of the ovaries, seeing that the elements of the ovary are well preserved after hysterectomy and ligation of the uterine horns. Retained uterine fluid does not counteract the atrophy of the uterus, which takes place after the removal of both ovaries. There is thinning out of the uterine wall at the point of greatest distension, and no compensatory hypertrophy has been observed.

(3) Removal of one ovary causes compensatory hypertrophy of the other in the anœstrous state.

(4) That the interstitial cells perform the chief rôle in the maintenance of the nutrition of the uterus is evidenced by the survival of these cells in grafted ovaries, the follicles becoming absorbed or cystic, and by the fact that no atrophy of the uterus occurs when these cells are present. The interstitial cells become functionally active during pro-œstrum, as shown by their being enlarged and their cytoplasm becoming infiltrated with a liquid substance (in female dog). That the corpus luteum is the part of the ovary which exerts the most active influence upon the body as a whole is shown by the fact that corpus luteum extract, when injected, causes rise of the general blood-pressure.

(5) From the result of one experiment it was found that the ovaries do not play such an important part in the elimination of calcium as is supposed, since after castration the calcium output was increased, whereas it was diminished as the result of administration of corpus luteum extract.

(6) Removal of the ovaries in rabbits causes an increased deposit of fat in the tissues of the body.

The paper is a careful and largely successful effort to determine the physiological effect of ovarian secretion and should be read by both gynæcologists and obstetricians. It will help to unravel some of the remaining mysteries regarding the physiology and physiological chemistry of menstruation, labour, and lactation, and will clear the way for the discovery of the nature of the toxins created by altered metabolism of the ovaries and other ductless glands, and thus help to save the lives of our patients suffering from these little understood toxæmias. Miss McIlroy's paper is also valuable to our Section as it is a foretaste of and will prove a guidance to a discussion on the subject which our Council hope to arrange at a later date.

PATHOLOGICAL CLASSIFICATION OF DISEASES OF WOMEN.

A valuable and suggestive paper was read by Dr. Fothergill, of Manchester, at the March meeting, on the desirability of using a pathological classification in text-books on "Diseases of Women," and he pointed out some disadvantages of the anatomical classification now usually adopted, mentioning particularly the difficulty of a student being able to learn the complete facts as regards cancer, tuberculosis, or gonorrhœal infection of the genital tract if he had to search for data under anatomical headings. There are only three books known to me, written on "Diseases of Women," with a pathological classification—viz., Ballantyne's "Essentials of Gynæcology," 1905; Blair Bell's "Principles of Gynæcology," 1910; and Fothergill's "Manual of Diseases of Women," 1910. Most text-books adopt both anatomical and pathological groupings, with cross references, and those who are accustomed to this double method, redundant though it is, may find it difficult to adopt a purely pathological classification. Dr. Fothergill's six divisions are:—

- (I) Developmental errors of birth and at puberty.
- (II) Vascular changes.
- (III) Mechanical lesions.
- (IV) Results of infection.
- (V) Progressive conditions (new growths, cysts, &c.).
- (VI) Retrogressive conditions.

In this review I have endeavoured to adopt Dr. Fothergill's classification.

(I) Developmental Errors.

The following communications may be grouped under this head:—

(1) *Bicornuate Uterus*.—I have already alluded to Dr. Beckwith Whitehouse's case of pregnancy in a rudimentary horn of such a uterus, with rupture at the fourth month. In October, Dr. McCann showed a specimen of bicornuate uterus with hæmatometra and hæmatosalpinx removed from a young unmarried woman who had had painful menstrual molimina since the age of 17. Her vagina was absent, but the crescentic hymen was present. After an unsuccessful attempt to open up the vagina Dr. McCann removed the bicornuate uterus and its appendages by abdominal section. The left horn of the uterus and the Fallopian tube contained blood. The patient made a smooth recovery.

Dr. McCann considers that the absence of the vaginal canal in these cases is more often acquired than congenital, and due to inflammatory atresia rather than to congenital deficiency. Dr. Herman quoted a somewhat similar case, and agreed with the author's view of the cause of the vaginal atresia. Other speakers thought that this and most other cases were congenital in origin.

(2) *Accessory Ovaries*.—At the April meeting, Dr. Glendining showed three specimens of fibro-adenoma of the ovarian fimbriae which, without careful microscopical examination, could easily have been mistaken for accessory ovaries; and also one nodule with a closer relation to the ovary, showing some similarity to ovarian structure. Dr. Glendining reviews the evidence in the recorded cases of accessory ovaries, and agrees with Mr. Alban Doran that this evidence usually rests on no scientific basis.

(II) *Vascular Changes.*

In June, Dr. Cairns Forsyth showed a specimen of a hæmatocele in a hydrocele of the canal of Nück, removed by operation.

(III) *Mechanical Disorders.*

Anterior Lip of Cervix adherent to Posterior Vaginal Wall.—At the December meeting, Dr. Hedley described a curious case where the elongated anterior lip of the cervix had been partially torn from its attachments, and had become adherent to the posterior wall of the vagina from just below the posterior lip of the cervix down to the perineum, which had been extensively lacerated. Mrs. Willey described an almost identical case.

(IV) *Infection.*

Under the head of infection I find but few cases.

Tuberculosis.

(1) There is one case of *diffuse tuberculosis of the uterus* described by Dr. Hubert Roberts, who showed the uterus removed by abdominal section. After the operation the uterus and tubes were found to be the seat of diffuse necrosing tuberculosis, the mucosa being less involved than the muscle. He thought the Fallopian tubes were primarily affected.

(2) In April Dr. Eden related a case of *tuberculous tubes with primary amenorrhœa*, and showed the uterus and appendages which he removed from a woman, aged 27, for severe left-sided pain which recurred every month. Both Fallopian tubes contained pus and were removed, and there was a pus cavity in one corner of the uterus, which was slightly less than the normal length. The uterus was therefore also removed, together with one ovary, which contained a recent corpus luteum. Dr. Eden believed the tubes were tuberculous, though Dr. Glendining could not be sure of this. Dr. Eden discussed the cause of the amenorrhœa, and wondered if it could be due to the suppuration in the Fallopian tubes, which might have been of long standing. He alluded to a case related by Mr. W. G. Spencer and Mr. Alban Doran, where similar attacks of pain with amenorrhœa occurred, and both tubes were found at the laparotomy to be absent. Mr. Spencer laid open the fundus, exposing the cavity of the uterus, and sewed both ovaries into the opening thus made, with a result that the patient subsequently menstruated regularly. Dr. Eden wondered if the amenorrhœa in these two cases could be due to failure of the discharged ova to reach the uterine cavity. Perhaps Miss McIlroy or Dr. Blair Bell could answer this point.

(V) *Progressive Conditions.*

The large bulk of the Session's communications will come under "Progressive Conditions," a group which Dr. Fothergill employs to include new growths, overgrowths, cysts, &c.

(1) *Fibromata.*

(a) *Fibrous Tumours of the Perineum.*—First amongst these are the two similar and remarkable cases of enormous fibrous tumours of the perineum described by Mr. J. D. Malcolm and Dr. F. J. McCann in October. In Mr. Malcolm's specimen the structure was fibro-cystic, while Dr. McCann's was a pure fibrous tissue of the consistence of a firm jelly, and in both cases the growth appeared to have developed from fascial tissue. In each case the tumours had grown upwards into the abdomen and downwards along the rectum and vaginal canals to form huge perineal masses which prevented the patients sitting. In each case they had been known to be growing four to six years. The tumours were removed by combined perineo-abdominal operations, but one unfortunately did not long survive the shock of the operation.

(b) *Fibroma of Labium*.—A large warty fibroma of labium, weighing $17\frac{1}{2}$ oz., was shown by Dr. Lediard. It had been growing twelve years, during which time the patient had had six children, four of whom were living. She had suffered severely as a child from inherited syphilis. The structure was fibrous tissue, arranged in nodules, rich in vessels, and covered by squamous epithelium.

(2) *Fibromyomata*.

(a) *Fibromyoma of Uterus*.—I have already referred to Dr. Purslow's case of fibroids associated with pregnancy. The only other cases were two degenerating fibroids described by Dr. Inglis Parsons. In one of these the uterus had been subjected to Apostoli's treatment twenty years previously.

(b) *The Radio-therapeutic Treatment of Uterine Fibromyomata*.—This subject is one that will be probably much debated in the future and will form part of one of the discussions at the Obstetric Section of the International Medical Congress in London next year, under the presidency of our distinguished Past President, Sir Francis Champneys. Our Section, therefore, was glad to hold a joint discussion last March with the Electro-Therapeutical Section, when an admirable paper on the subject was read by Dr. Bordier, of Lyons. For the first time in this country precise indications and contra-indications were given. Thus the age of 39 was stated to be the inferior limit for radio-therapeutic treatment. Patients below that age are better treated surgically. Interstitial fibroids, and women who suffer from menorrhagia rather than metrorrhagia, yielded best to the treatment, especially at menopause ages. Radio-therapeutic treatment should not be used for degenerating, malignant, infected, or inflamed fibroids, or where there are inflamed tubes or pelvic peritonitis also existing. Dr. Bordier prefers three or at most five sessions, with nine irradiations in each, and gives careful details of dosage. He alludes to the dangers of erythema, dermatitis, and trophic troubles, which may not declare themselves for twelve months after the irradiation, and describes the safeguards indicated. Finally, he gave statistics and described the clinical results of irradiations, and both are distinctly favourable to the usefulness of this new method of treatment.

(3) *Fibrosis of the Uterus.*

This condition has not received the attention it deserves. Very little is known of its ætiology and differential diagnosis, and its treatment is at present very unsatisfactory. Dr. Cuthbert Lockyer described one case in which, after several curettings, he had performed utriculoplasty for uncontrollable hæmorrhage, and subsequently, as no improvement followed, he had performed hysterectomy. The discussion which followed seems to indicate that utriculoplasty will not receive a permanent place in gynæcological therapeutics.

(4) *Ovarian Cysts.*

In November, Dr. Macnaughton-Jones described a case of large ovarian cyst, complicated by hernia and ascites, and in December the same Member showed an ovarian cyst which had developed from an ovary which had been resected twenty-one months previously, when the opposite ovary had been removed. In March, Dr. Hubert Roberts showed a specimen of ovarian hæmoliths, and Dr. Lediard showed an extra-peritoneal dermoid cyst which had suppurated. He was able to remove the cyst entire after tapping it. The pus was sterile. He referred to several other similar cases.

(5) *Malignant Growths.*

(a) *Cancer in relation to other Pathological Conditions.*—Three specimens were shown mainly owing to their association with other conditions. Thus in November, Mr. William Turner and Dr. Lockyer related the history of a patient, aged 50, from whom the former surgeon had removed the enlarged tuberculous Fallopian tubes in March, 1910. After recovery from the operation she had a course of tuberculin for twelve months and greatly improved in health. Uterine hæmorrhage then occurred, and the uterus and ovaries were removed and were found to be the seat of cancer with varying histological characters. At the same meeting Dr. Inglis Parsons and Mr. Glendining showed a *fibroid uterus with carcinoma of the cervix* removed by abdominal panhysterectomy, and Dr. Macnaughton-Jones showed a specimen of *cancer of the cervix associated with fibroma of the ovary*.

(b) *Primary Carcinoma of Ovary.*—In December, Dr. Barris showed a solid tumour of the ovary removed two months previously by Dr.

Williamson from a girl, aged 16. The patient had remained well since this operation. He believed the tumour was malignant. There was no ascites. The remaining ovary was also removed though it appeared healthy. Nothing abnormal was discovered in the other viscera. Dr. Barris found that the apparently normal ovary was also malignant. The Pathology Committee agreed with Dr. Barris's opinion that the ovarian solid tumour was spheroidal-celled carcinoma, but the majority of the Committee found no definite evidence of malignancy in the normal-looking ovary.

(c) *Carcinoma of Vulva*.—At the same meeting Dr. Macnaughton-Jones showed microscopical sections from a carcinoma of the vulva removed from a woman, aged 79.

(d) *Primary Carcinoma of Urethra*.—Mr. Beckwith Whitehouse described the history of an advanced and inoperable case of this somewhat rare disease in a feeble woman, aged 59. He discussed the relationship of epithelioma to urethral caruncle or other inflammatory urethral trouble, and he thought they might each predispose to the new growth. He divided primary urethral epithelioma into two main classes—the more usual vulvo-urethral and the rarer primary urethral growths. The growths are usually squamous-celled or more rarely columnar-celled epitheliomata, and more rarely still adeno-carcinoma developing in the peri-urethral glands.

(e) *Rhabdo-sarcoma of Uterus*.—In January, Dr. W. Blair Bell, of Liverpool, showed the uterus and appendages of an unmarried woman, aged 70, which had been removed a few days after a piece of growth, found to be a mixed-celled sarcoma, had been spontaneously expelled. A second operation for intestinal obstruction ten weeks later revealed that the abdomen was full of growth of the same nature.

Growths of Doubtful Character.—There have been many tumours referred to the Pathology Committee, which, under the Chairmanship of Dr. Walter Griffith, continues to do excellent work for the Section and for science. In most cases the view taken by the exhibitor of the specimen has been upheld by the Committee, in a few the exhibitor's view is not accepted, but usually the exhibitor is converted and agrees with the Committee's views. More rarely the Committee's view is not accepted by the exhibitor. This difference of opinion sometimes leads to the Publication Committee having difficulty in deciding upon the precise title of the communication for the *Proceedings* of the Section.

The following are some of the specimens of doubtful nature shown during the Session :—

(1) *Exfoliated Endometrium*.—At the January meeting Dr. Blair Bell showed two specimens of uterine cast passed by the same woman on two occasions, both showing effusion of blood and the so-called decidual appearance which Dr. Bell considers to be due to swollen and degenerate cells. He did not believe these casts were evidences of early abortion. Several speakers alluded to cases where such casts were passed during cohabitation, and ceased during sexual abstinence, and these and others could not agree with Dr. Blair Bell's conclusions without further evidence. These specimens do not appear to have been referred to the Pathology Committee, but are to be further reported upon by the author.¹

(2) *Supposed Carcinomatous Sarcoma of Ovary*.—At the same meeting Dr. Blair Bell also showed two solid ovarian tumours removed from a woman, aged 29. She had had incontinence of urine for three months, scanty menstrual losses, much leucorrhœa, and an enlarging abdomen. The tumours occupied the true pelvis and lower abdomen. There was some ascites. No recurrence had taken place in the eight months following the operation. He considered the tumour to be mixed carcinoma and sarcoma, and had only been able to find the records of two other similar ovarian growths. The specimen was referred to the Pathology Committee, which did not consider the growth was carcinomatous, and though much struck with its exceptional and richly cellular structure, considered it to be either an actively growing fibroma or a fibroma becoming sarcomatous. Dr. Blair Bell was not convinced by these views. The future history of the patient will be important.²

(3) *Growth simulating Chorionepithelioma*.—At the same meeting Dr. Bright Banister showed sections of a growth simulating chorionepithelioma. The growth was protruding from the uterus of a woman, aged 47, whose last child was born eight years previously. Nothing beyond removal of the growth could be effected owing to extension of the growth into the bladder. Dr. Banister found areas of syncytial-like cells resembling those found in chorionepithelioma, but the Pathology Committee considered the growth to be a squamous-celled carcinoma with numerous large cell-fusions, some of which were undergoing keratoid changes. Dr. Banister agreed with the Committee's view.

¹ See *Proceedings*, p. 371.

² See *Proceedings*, p. 372.

He tells me that the patient symptomatically improved under exposures to radium, and that the local induration was lessened, but that now hæmorrhage has returned and her general health is failing.

(4) *Fibroid Polypus with Glandular Invasion*.—In April, Dr. Drummond Maxwell showed a fibroid polypus with glandular invasion. During the exploratory dilatation of the uterus caseous matter came away, and under the microscope these fragments showed proliferating glandular elements in a degenerating stroma, and were believed to be malignant. Panhysterectomy was therefore performed, when a small fibroid polypus growing from the internal os was found with an irregular friable surface. Gland tubules actively proliferating were found in all portions of the fibroid, but their lining membrane was uniformly single-layered. Dr. Maxwell looked upon the polypus as an early stage of a malignant adenomatous growth invading the fibroid polypus. Dr. Spencer and Dr. Griffith and others disagreed as to the malignancy of the glandular invasion of the fibroid, and their view was subsequently adopted by the Pathology Committee.

(5) *Submucous Uterine Growth of Doubtful Character*.—Dr. Briggs showed a uterus with a submucous lobulated growth of doubtful character removed by subtotal hysterectomy. There had been continuous bleeding for eight months. The patient was now, six months after operation, quite well. The nature of the growth was uncertain, as in parts it appeared to be of myomatous structure, in others a short spindle-celled sarcoma.

Three communications would, in Dr. Fothergill's pathological classification of the "Diseases of the Reproductive Organs," have to be relegated to the appendix or omitted altogether:—

(1) *Broken-glass Catheter removed from the Bladder*.—Dr. Lewers had performed Cæsarean section upon this patient for obstructed labour due to contracted pelvis, and during that labour—the head presenting—a nurse had left the catheter in the urethra, and it broke during a pain. Dr. Lewers dilated the urethra and removed the catheter by forceps.

(2) *Ganglion Neuroma of Mesentery*.—This formed a large tumour and was removed successfully by Dr. Macnaughton-Jones by an operation of considerable difficulty from a patient aged 18. The tumour was a neuroma containing ganglion cells and was connected with the sympathetic system. In places it was embryonic and histologically malignant.

(3) *Amenorrhœal Insanity*.—On the suggestion of Dr. Walter Griffith a joint discussion with the Medico-Psychological Association

on this subject was held last November, and was introduced by a thoughtful and suggestive paper by Dr. C. T. Ewart, who argued that those who accept puerperal insanity as an entity must admit that amenorrhœal insanity should occupy a similar position, the cause of each being due to auto-toxæmia, and the symptoms present being practically akin. Dr. Robert Jones agreed that there were cases of insanity caused by amenorrhœa, but thought that as a rule the insanity was usually a correlative of the amenorrhœa, and that both were due to a more remote cause such as a toxin, and the President suggested that such a toxin was probably due to an altered internal secretion of the ductless glands, including the absence of the primary product of lutein tissue. Dr. Macnaughton-Jones did not consider the title of the paper to be scientifically justified, and both he and Dr. Percy Smith thought that it was actually dangerous to use such a term as "amenorrhœal insanity." Dr. A. W. Russell, of Glasgow, also criticized the term, and both he and Dr. Walter Griffith thought further study of the subject was urgently required. The President of the Medico-Psychological Association, Dr. Dawson, of Dublin, did not believe there was a special form of insanity produced by amenorrhœa, and he endorsed the general opinion of those present when he said that the existence of amenorrhœal insanity as a definite morbid entity was "not proven."

GENERAL OBSERVATIONS.

Your Council has endeavoured to represent to the Commissioners of the National Insurance Act the very serious effect upon the midwifery training of students and pupil midwives and upon poor parturients which may follow the working of the Maternity Clauses of the Act. It is possible to so interpret the words of these clauses and the model rules founded upon them, that women who are confined in lying-in wards or hospitals, and those attended by medical students or pupil midwives, will be penalized by losing their maternity benefit. If so, this would tend to encourage such women to make other arrangements for their confinements, and midwifery training could not be carried out so as to satisfy the existing regulations of the General Medical Council and of the examining boards. Your Council through a sub-committee and by correspondence have represented these facts to the State Sickness Insurance Committee of the British Medical Association and that body was in sympathy with our views, and encouraged us to communicate

them to the Commissioners of the Act.¹ This we have done. We have also sent full details of our views to the General Medical Council and that body has appointed a standing sub-committee to report upon the effects of the Insurance Act upon medical education.

On June 18 the General Medical Council sent an important memorandum on the subject to the Commissioners, and this communication with its covering letter and the reply of the Commissioners, dated June 24, is published in this week's (June 29) *British Medical Journal* Supplement, p. 709, and *Lancet*, p. 1793. We are safe, I think, to leave the matter in the hands of the General Medical Council, more especially as Sir Francis Champneys is on the sub-committee of our own Council as well as on that of the General Medical Council.

I must take this opportunity of thanking the Section for having elected me President for a second year, and for their kind forbearance of my shortcomings, and to ask them for continued kindness during next session.

¹ *Brit. Med. Journ.*, 1912, i, p. 975.

